ASARCO EAST HELENA SMELTER 2008 INTERIM MEASURES WORK PLAN ADDENDUM

BLAST FURNACE FLUE AND MONIER FLUE CLEANING AND DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

Prepared by:
ASARCO LLC

February 2008
Revised May 2008

ASARCO

Linda Jacobson (3 Copies)
RCRA Project Manager
US EPA Region VIII 8ENF-T
1595 Wynkoop Street
Denver, Colorado 80202-1129

May 8, 2008

SENT BY FEDERAL EXPRESS

RE: 2008 Interim Measures Work Plan Addendum, May 2008
Asarco East Helena Facility

Dear Ms. Jacobson:

Asarco is submitting the enclosed 2008 Interim Measures Work Plan Addendum (May 2008) for the Asarco East Helena Facility. A copy of the Addendum is simultaneously being submitted in the enclosed compact diskette. The 2008 Addendum was originally submitted February 2008. The enclosed May 2008 Addendum has been revised to reflect responses to EPA written comments and to the technical discussions that took place on May 2, 2008 between Asarco, EPA, and the State of Montana. The Addendum, compact diskettes, and the certification signed by an officer of ASARCO (Asarco) are attached to this letter.

As you know from our recent conversations and from our previous correspondence, Asarco intends to begin the work outlined in the 2008 Addendum no later than June 11, 2008. Asarco is awaiting the State of Montana's review and approval of Asarco's 2008 Cleaning and Demolition Work Plan, along with Asarco's responses to their April 9, 2008 comments. The completion schedule for the two Work Plans directly support each other and must be implemented collectively to achieve prescribed objectives.

We look forward to working with the agency as we proceed with the project. If you should have any questions regarding this Project, please contact me at 227-4529.

Sincerely,

Jon Nickel

Enclosures

CERTIFICATION
PURSUANT TO U.S. v ASARCO INCORPORATED
(CV-98-3-H-CCL, USDC, D. MONTANA)

I certify under penalty of law that this document, 2008 Interim Measures Work Plan Addendum (May 2008) and all attachment, were prepared under my direct supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and completes. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature _____
Name: Thomas L. Aldrich
Title: Vice President Environmental Affairs
Date: May 6, 2008

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1.0 INTRODUCTION

On May 5, 1998, ASARCO LLC (Asarco) and the United States Environmental Protection Agency (EPA) entered into a Consent Decree (RCRA Consent Decree, U.S. District Court, 1998) to initiate the corrective action process in accordance with the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA). As part of the RCRA Consent Decree, Asarco prepared several site investigation documents including:

- RCRA Current Conditions/Release Assessment (CC/RA) (Hydrometrics, 1999a)
- Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b)
- RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000) and
- Phase I RCRA Facility Investigation Report (Asarco Consulting Inc. (ACI) 2003, revised 2005).

A complete listing of RCRA Consent Decree documents is contained in the Phase I RCRA Facility Investigation (RFI) report.

As part of the RCRA Consent Decree, several interim measures were implemented for groundwater between 1999 and 2001. These earlier interim measures (IM) performed as part of the RCRA Consent Decree are discussed in Section 1.3 of the Phase I RFI report.

In May 2002, a RCRA Interim Measures Work Plan Addendum (IMWPA) was prepared (Hydrometrics, 2002). The 2002 IMWPA addressed groundwater in the intermediate aquifer

within the City of East Helena and down-gradient residential groundwater supplies north of the Asarco Plant site. These interim measures are discussed in Section 1.2.1.3 of the IMWPA.

In 2007, EPA notified Asarco and the Montana Department of Environmental Quality (MDEQ) that the cleaning and demolition of the blast furnace flue and Monier flue was to be conducted in accordance with the RCRA Consent Decree. As a result, the cleaning and demolition procedures for these flue systems are included in Section 2 of this 2008 IM Work Plan Addendum. The cleaning and demolition work for the blast furnace flue and Monier flue is scheduled to be conducted in 2008. The implementation of the 2008 IM Work Plan Addendum is linked to the implementation of Asarco's 2008 Cleaning and Demolition Project Work Plan. The completion schedules for both work plans directly support each other and must be implemented collectively to achieve prescribed objectives. The location of all cleaning and demolition areas scheduled for 2008, under both work plans, are shown on Figure 2-1.

In January 2008, EPA requested that Asarco submit a work plan that addressed exposed soil areas associated with all cleaning and demolition areas, including the blast furnace and Monier flues, for exposed soil areas associated with the cleaning and demolition of structures addressed as part of the October 2007 Administrative Order Consent (AOC) with MDEQ. While MDEQ is the lead agency (with the exception of the blast furnace flue and Monier flue) relative to cleaning and demolition of structures above ground, EPA under RCRA is the lead agency for any investigation or corrective actions below ground (personal communication, Linda Jacobson, EPA, 2008). In February 2008, Asarco submitted a 2008 Interim Measures Work Plan Addendum (Asarco 2008a) for conducting the site-wide soil sampling excavation and confirmation sampling in exposed areas (unpaved soils) on the site that are scheduled for cleaning and demolition activities. This Interim Measures Work Plan Addendum (May 2008) revision includes changes based on EPA written comments and discussion with Asarco and MDEQ on May 2, 2008. The exposed soils sampling procedures for the flues, as well as the other areas of exposed soils are addressed in Section 3.

2.0 2008 BLAST FURNACE FLUE AND MONIER FLUE CLEANING AND DEMOLITION WORK

The dust cleaning process employed by Asarco during calendar year 2001 removed the majority of blast furnace flue and Monier flue dust. Minimal amounts of dust remain within the flues, which are primarily confined to inaccessible, overhang areas. The following sections describe remaining cleaning techniques, dust control activities, and demolition procedures.

2.1 PRE-DEMOLITION CLEANING ACTIVITIES

The intent of the pre-demolition cleaning is to reduce the potential for fugitive dust emissions during demolition. URS/CWC will take precautions, as addressed in the Site-Specific Health & Safety Plan, when working with and handling heavy metal contaminated materials. In general, URS/CWC's method for addressing heavy metal dust/debris removal will consist of:

- Work Area preparation
- Initial Dry Removal of Bulk Solids and
- Moistening of Building Interiors for Dust Control.

Work area preparation will consist of delineating a work area that can be both easily contained and is considered a cohesive area unit with like contamination (i.e., Baghouse, Blast Furnace Flue, Monier Flue, etc.). Once the work area has been defined, URS/CWC will begin the removal of bulk solids. The goal of this task will be to remove the gross, dry accumulation of contamination (lead, lead dust, lead debris) at all accessible areas. This will be performed by personnel utilizing hand tools and a trailer mounted "Hurricane" vacuum system with HEPA filtration. Waste will be loaded via air tight chute into double 6-mil mega bags (or similar container) and hauled within these containers directly to the CAMU. This initial removal of the gross, dry accumulation of solids at ground level will ensure a more effective and more controlled method of demolition and overall dust control.

Upon completion of the gross debris removal at ground level, URS/CWC will initiate the pre-wetting and moistening of the building interiors. After review of the building interiors, URS/CWC has determined that accumulated dust on various horizontal surfaces within the interior presents a potential for airborne dust. The purpose of this operation will be to mitigate airborne dust generation during the above grade demolition operation. This pre-wetting activity will be accomplished through a combination of methods, including water hoses, water trucks, and misting systems. URS/CWC realizes that is not feasible to remove all heavy metal laden dust from all surfaces and confined areas prior to demolition. URS/CWC will focus its efforts on mitigating the generation of airborne dust during the demolition and material handling operations.

URS/CWC will utilize the services of a subcontractor, IRS Environmental, to perform the removal of lead and heavy metal laden dust and debris from blast furnace and Monier flue area. IRS Environmental has further procedures for this activity as delineated in their "Hazardous Material Abatement Plan" which is provided in Appendix A.

URS/CWC and IRS Environmental have identified vehicle overpasses, flue transitions, and confined areas within the Blast Furnace and Monier Flues, which do not appear to be structurally sound and present a health and safety hazard for the presence of personnel. Prior to the start of the flue pre-cleaning operation, URS/CWC and IRS Environmental will evaluate the entire flue for these suspect areas and will clearly mark and delineate those areas that are deemed unsafe for working personnel. These delineated areas will not be pre-cleaned as described above. However, they will be handled and addressed during the normal demolition process. URS/CWC will minimize releases of lead bearing materials by implementing dust suppression measures as further discussed by Section 2.2.10.1 (water fogging methods, water application using manlifts, etc.). Demolition will proceed in a controlled manner. URS/CWC may consider additional dust control measures during this process.

2.2 GENERAL DEMOLITION PROCEDURES

The general cleaning and demolition procedures for the blast furnace flue and Monier flue are described in this Work Plan. These procedures include cleaning and demolition of the remaining portions of the blast furnace flue and Monier flue (see Figure 2-1). Prior to above grade structural demolition, site inspections will confirm that:

- Pre-demolition decontamination and cleaning are complete and
- Any required interior and exterior asbestos abatement operations are completed.

Pre-demolition decontamination and cleaning are described in Section 2.1 above.

Asbestos abatement methods are also included in this Work Plan. Asbestos mastic is present on some of the blast furnace flue brick. The associate flues and structures will be subject to asbestos abatement activities prior to and during demolition as required. URS has hired an asbestos abatement contractor (IRS Environmental) to perform asbestos abatement activities. Their work procedures and methods are described in Appendix A of this Work Plan.

Any friable and removable asbestos materials will be removed and handed prior to demolition in accordance with the asbestos plan in Appendix A. An exception is the asbestos mastic present on some of the blast furnace flue brick. There is no practical and safe way to remove the mastic prior to demolition. The mastic is non-friable and is not considered a potential airborne hazard. In addition, most of the mastic is covered in insulation foam, which is also not practical to remove prior to demolition. As a result, bricks with mastic will be handled using the same procedures as other concrete masonry as described below in Section 2.2.3.

2.2.1 Isolation Activities Before Demolition of Structures

Before and/or concurrent with the abatement and removal of regulated wastes, isolation activities will be conducted to create a physical separation of the blast furnace and Monier flues from the surrounding structures, piping, items, that are to remain. This will be conducted in a variety of methods employing both excavators equipped with shear

attachments and laborers with hand tools and cutting equipment. Prior to initiation of the isolation work, the contractor will perform an investigative site walk with ASARCO personnel to re-mark and re-designate the lines of separation between the demolition areas and surrounding areas to remain.

Piping, conduits, and structures that are accessible to an excavator will be selectively sheared at the marked isolation location. The member to be isolated will be cut in such a manner that it will fall away from areas to remain and be protected in place. As members are cut and removed, they will be placed behind the excavator for handling and staging accordingly. Certain piping, conduits, and structures that are not accessible to an excavator that require isolation will be removed by hand using man lifts to position workers with hand tools to cut members free using hand saws or torch cutting equipment. Components will be secured to a crane, forklift or bucket loader and lowered to the ground, or may be allowed to sag to the ground as supports are disconnected.

Upon completion of the isolation task, a physical separation will exist that will ensure areas to remain are protected in place and that the demolition activities can progress unimpeded. Inspection of operations will be conducted by both the Site Superintendent to ensure that exclusion zones are established and that safe working conditions exist at all times. Regular daily safety meetings will be conducted by each foreman to discuss methods, exclusion zones and safety practices. Materials are to be removed from the working area on a daily basis to provide safe working conditions for the men and equipment.

2.2.2 Steel Structure Demolition

Although little or no steel demolition is expected for demolition of the blast furnace flue and the Monier flue, steel structure demolition may be required for portions of the flues that connect with other structures. The approach for steel demolition is described as follows:

The approach to building demolition is to use excavators (track-mounted) equipped with specialty attachments (such as shears, breakers and grapples) to structurally remove, bay by bay, the various structural members. The sequence approach is as follows:

- Each structure will be demolished using excavators with specialized attachments. Each truss frame structure between bays will be lowered and/or dropped to the ground by separating the portion of the tension members on the bottom cord to cause the truss to sag in between two bays.
- The excavator will then separate the remaining tension members of the truss to allow one end of the main truss to become separated from the supporting column.
- The other end (still connected) of the truss will be disconnected. The remaining roof traverse trusses, connecting main truss to main truss shall be removed to allow placement of the main truss behind the equipment for salvage. The remaining portion of the roof attached to the next bay section will be cut allowing for removal. The excavator will then drag the roof section for stockpiling and separation. This process is repeated for each of the numerous bays within each of the above referenced buildings.
- Steel columns will be cut with a shear at the base, and allowed to fall to the ground.

All material will be staged behind the working areas of the primary excavators, where it will be prepared by additional shears before it is loaded into dump trucks and hauled to the material staging and processing area just to the north of the Coverall Buildings. Materials will be continuously removed to allow other operations to proceed.

2.2.3 Concrete/Masonry Structure Demolition

Concrete/masonry demolition will constitute the majority of demolition work for the blast furnace flue and Monier flue. The approach is described as follows:

A 100,000 lb excavator (or larger), equipped with a breaker, and a track loader will be utilized for the complete above grade concrete demolition operations of the various concrete and masonry structures. The exterior walls are constructed of either a concrete block material or a brick material. Starting at one end, URS/CWC will commence breaking from the top of the wall down from column to column. Once complete with the exterior wall at the end, URS/CWC will commence the removal of the concrete upper

floors slabs within the same constraints as the wall. This process is limited to the first exterior column line. Demolition of any elevated floor slabs and walls will be completed in a top down approach for each individual column line. URS/CWC will break the closest interior columns under the roofs and floor, allowing the individual floor to sag. URS/CWC will work into the building, breaking the sagged slabs and allowing the debris to fall to the ground. Floor slabs within the blast furnace flue and Monier flue area will be left in place. Once complete for that column, URS will repeat the same procedure for the remaining column lines. Utilizing a track loader, the broken concrete debris will be removed and hauled directly to the CAMU.

2.2.4 Demolition Material Stockpiling

Flue demolition debris (consisting of concrete and brick with the majority of flue dust removed) and associated debris from the blast furnace flue and Monier flue will handled as follows:

As steel structure and concrete demolition is progressing, material will be hauled and stockpiled in the designated material staging and processing area (see Figure 2-1) located within the demolition area footprints. At these locations, salvageable metal materials will be sized to meet the requirements of the final disposition location. Any necessary sizing of general demolition debris will take place at the demolition site. Once general demolition debris has been segregated and sized, URS/CWC will load and haul the material to the CAMU. With regards to salvageable metals, URS/CWC will size the material to its requirements and stage the material for eventual loading into railcars and/or trucks for transport to the recycling facility.

2.2.5 Debris Transportation

Demolition debris will be transported using procedures are described as follows:

URS/CWC understands the critical nature of loading and transporting of waste debris from either containment buildings or demolition areas to the CAMU. Therefore, URS/CWC will take a proactive approach to ensure that the transportation of waste debris does not generate dust or spread waste debris outside the limits of the loading area

and the final CAMU placement area. For all demolition debris, as further described below, URS/CWC will utilize water trucks and misting systems to keep debris moist during the demolition and loading process. These two operations will minimize airborne dust during the loading operation and be the first step in prevention during transportation.

URS/CWC anticipates utilizing 25-35 ton rock trucks and/or 10-wheel dump trucks, or a combination thereof, to haul the material to the CAMU. All trucks will be equipped with sealed tail gates that will be closed during times of hauling to ensure that debris is not released outside the limits of the loading and dumping areas. In order to further mitigate dust generation during hauling operations, URS will construct a truck moistening station at the exit of the ASARCO site over to the CAMU site. This station will consist of a scaffolding platform on which personnel will mist water on the loaded debris as a final step before it travels outside the property fence line and across the County road. The spray will add a final moisture barrier/binder to the debris for the short distance to the CAMU. Transport vehicles will be limited to a maximum 10 miles per hour while both on-site and during transport. Limiting speeds will prevent dust from become airborne during transport and will prevent the kick-up of dust due to rolling tire action.

Transport of waste on-site will follow prescribed paths, which will be determined during the course of demolition. Due to the changing nature of the site as demolition of structures progresses, haul routes will require modification. However, once defined, these haul routes will be enforced to create dedicated routes that can be maintained to mitigate dust and debris migration, and prevent any potential spread of contamination. Maintenance of haul routes will be conducted through routine daily inspection to ensure that debris is not being released. Additionally, haul routes will be lightly wet with a water truck on a frequent basis throughout any given day to prevent the generation of dust due to vehicular traffic. URS/CWC will utilize the services of a street sweeper to clean the haul routes of accumulated debris and dust. This debris and dust sweepings will be dumped on-site and handled as demolition debris for eventual placement into the CAMU.

2.2.6 Final Cleaning Actions

Once demolition is complete and the debris has been removed, a final inspection of the floor foot print of the blast furnace flue and the Monier flue will be conducted. A visual survey will be conducted to catalog any area within the structure footprints where concrete is not present and underlying soils may have been exposed to flue dust or other elevated metal bearing materials. The survey will also document the condition of concrete within the structures and floors. The documentation will include a description and photographs. All exposed soil areas, broken or severely cracked concrete areas will be mapped and recorded on plan views of the demolished structures.

2.2.6.1 Concrete Floor Area Cleaning

The final cleaning of concrete covered demolition footprint areas will involve a three-phased approach. First, the concrete footprint will undergo a rough cleaning using conventional scraping and shoveling methods to remove any solid residues that may have accumulated during the demolition process. Second, the concrete footprint will be mechanically swept. The use of a mechanical sweeper will remove surface materials that may not be completely removed using scraping and shoveling techniques. Finally, the concrete footprint will be cleaned using a high-velocity, truck mounted vacuum. This final cleaning method will remove any fine material, particularly along the interfaces between the concrete floor and building columns, fan foundations, and support walls.

2.2.7 Plug and Abandon Underground Piping

Underground piping exists within the footprint in which cleaning and demolition will take place. The underground piping will be plugged and sealed in place. The utility locates will be performed by the URS/CWC and compared with the utility drawings and underground utility information provided by Asarco to identify as many underground utilities as possible. The underground utility map provide by Asarco is included in Figure 2-2. The abandoned underground utilities that will be flow filled is included in Figure 2-3.

The utility piping will be flushed with water and blown out with air. An anti-bacterial agent will be added to the water used in flushing the sanitary sewer system. URS/CWC anticipates

that some utilities/piping may contain some residual material (e.g. plant water, residual pipe sediment, sewage) from previous activities will take necessary precautions in the handling and disposal of any such materials. The water collected from the flushing of the underground utilities will first be routed to Asarco's on-site car wash thickener building for solids separation and then to Asarco's on-site water treatment facility for treatment. Large solids (if any) will be dried at the car wash thickener building prior to placement in the CAMU. Any fine sediment (if any) that pass through the car wash thickener process will be managed in the sediment handling system of the water treatment facility and transported off-site for disposal. This process is similar to the one used when cleaning the interior of the sinter stack in 2007. Sediment that may be present in the ferrous-containing plant water pipe and plant water return lines will be comprised primarily of rust. Since Upper Lake provided the water source for the Wilson Irrigation Ditch and the non-contact Upper Lake acid plant water system, any sediment that may be present in these two systems will likely be Upper Lake pond sediment. Further characterization of the sediments removed from the flushing of the underground utilities will not take place but will be managed as previously described.

All existing underground utilities (e.g. piping conduits, catch basins, manholes, Wilson irrigation ditch) will be plugged/capped and abandoned in place along their entirety utilizing flow fill or other approved material. The flow fill will be introduced using pressure not to exceed 100 psi. The grouting will continue at the inlet of the underground utility until a steady flow of grout exits the pipe outlet. The outlet will be sealed then the inlet will be grouted under pressure using a pressure between 50 and 100 psi.

2.2.8 Capping of Demolished Areas

The areas where above grade demolition activities will be completed will be sealed in a manner that will mitigate the infiltration of water.

2.2.8.1 Interim Cap Techniques, Procedures and Materials

The blast furnace flue and Monier flue areas where above grade demolition activities will be completed will be covered in 2008 as delineated on Figures 2-4 and 2-5 with 10-oz geotextile and a geomembrane cap of 24-mil RPE liner.

Upon completion of the demolition operations and area clean-up, URS/CWC will remove all debris and items from the slab that could possibly penetrate the geotextile and geomembrane. URS/CWC will utilize the existing on-site fumed slag as fill material over the remaining demolition slabs/areas. This fumed slag will be placed and rough graded to create the positive drainage. The fumed slag has been used as a grading material at the plant site in the past and possesses good physical characteristics for fill or sub-foundation uses (granular material and compacts wells). Although fumed slag contains elevated total metal concentrations, the metals are bound in a silicate-iron matrix with characteristics of low metal leachability. The potential for metal migration from the fumed slag is low. In response to EPA's July 6, 2006 comments, Asarco provided the rationale for using fumed slag for backfilling purposes, including study results derived from the RCRA Consent Decree investigations. The slag-related investigative results contained in the Current Condition Release Assessment (CC/RA, January 1999) and qualitative analyses of fumed slag (May 2001) are attached as Appendix B. In April 2005, Montana Department of Environmental Quality representatives collected fumed slag samples from the East Helena Plant to assess the potential environmental impacts from its use as an iron substitute within the cement manufacturing industry. A copy of the April 2005 fumed slag sampling event results is attached as Appendix B. A July 2006 Department Environmental Impact Statement (EIS) contains additional slag related information.

The geotextile and geomembrane will be laid, seamed, and secured as detailed. Additionally, sandbags will be placed intermittently within the center liner area to prevent the liner from being picked up by wind uplift or other forces. This will be done in sufficient quantity to ensure the liner stays in place. As an added preventative measure, URS/CWC will utilize sandbags made of UV Resistant 9-mil PE, which will provide superior UV resistance (compared to standard plastic woven sandbags) to prevent breakdown by sunlight.

The interim caps will be constructed to cover newly exposed footprints in the blast furnace and Monier flue demolition areas. Scheduling is discussed further in Section 4.0.

The interim cap details and specifications are shown on Figure 2-5. In general, from the top down, the interim cap will consist of the following:

- Sand bags to hold down the interim cover during windy periods
- A 24-mil reinforced polyethtylene (RPE) with the PRE seams overlapped 3 inches and sewn
- A minimum 10 ounce non-woven geotextile
- A prepared sub-grade consisting of fumed slag fill for grading purposes and
- Existing soils, concrete slabs and/or concrete foundations.

2.2.8.2 Maintenance of Interim Cap

Site Inspection

Periodic inspections of the interim cap will be conducted to ensure that the interim cap systems are performing adequately and to identify problems and provide proper maintenance of interim cap systems. The inspection program will involve three types of inspections: (1) informal inspections, (2) periodic technical inspections, and (3) special inspections after extreme events.

The informal inspection is actually a continuing effort by on-site personnel, performed in the course of their normal duties. Periodic technical inspections and inspections after extreme events will be performed by onsite Asarco staff (or other technical representatives) familiar with the design and construction of the cover systems. The periodic technical inspection will be performed monthly to document the condition of the cap components. Special inspections are very similar to periodic technical inspections but are performed only after an extreme event such as a rare rainstorm, tornado, or earthquake.

The inspection of the cover systems will typically involve walking the entire site in a systematic fashion that ensures a comprehensive review. If any problem or deficiency is found, the inspector will record the location on a field sketch. A complete description of the affected area, including all pertinent data (i.e., size of the area and other descriptive remarks such as exposed synthetic materials) will be recorded on the appropriate reporting forms. An accurate and

detailed description of observed conditions will enable a meaningful comparison of conditions observed at different times.

Photographs may be helpful in documenting problems. Provisions will be made to keep a photographic log of problems, repairs, and general site conditions. This log will provide valuable information when evaluating the performance of the cover system and when planning repair strategies.

It is important to have a record of site conditions at various stages after capping. Good documentation will provide valuable information to help maintenance and repair planning. Inspection checklists to assist in the inspection and documentation procedures will be developed and modified as needed throughout the interim capping period. The checklist will (at a minimum) contain items to evaluate such as membrane condition, sand bag condition, liner seams, liner/concrete attachments and site drainage. A copy of an example inspection form is attached in Appendix C.

Site Security

The interim cap will be contained within the fenced Asarco facility and will be kept secured so that people or animals do not disturb the cap. Site access for ongoing plant or demolition operations will be limited through the use of barricades, barrier tape, or temporary fencing. Plant personnel will advise contractors conducting site activities of access limits within or near capped areas.

Site Maintenance

As shown in Table 2-1, there are four different types of maintenance tasks listed by priority rather than by frequency. Table 2-1 is provided as a guide to prioritize the different types of maintenance activities in proper perspective. The different types of maintenance are also discussed in the following subsections.

1. Emergency maintenance - Emergencies are situations arising unexpectedly that require urgent attention. Often, immediate response must be provided to avert potential serious damage. Provisions for emergency repair/damage control activities must therefore be in-

place prior to the occurrence. Toward this end, an Emergency Contacts list will be prepared and kept current, and include local emergency response organizations, assigned maintenance personnel, and agency and owner representatives. Table 2-2 provides a partial list of emergency contacts.

2. Preventative maintenance - Preventative maintenance will be performed to extend the life of equipment and structures. With the exception of routine surveillance and inspections, preventative maintenance tasks should be scheduled in accordance with the recommendations of the material and equipment manufacturers. Scheduled inspection and maintenance of all site facilities will help ensure that potential problems are discovered and corrected before they become serious, as well as providing for the performance of periodically required upkeep. During routine inspections, the Asarco personnel should be alert for any abnormal conditions, which could indicate potential problems.

3. Corrective maintenance - Corrective maintenance consists of repair and other non-routine maintenance. Asarco personnel must always be ready to handle these tasks as the need arises. Corrective maintenance procedures should follow the equipment or material manufacturer's recommendations. In planning for the corrective maintenance, arrange for the assistance of an engineer or manufacturer's representative, if necessary.

4. Housekeeping - Maintaining well-kept facilities indicates pride on the part of the Asarco personnel, and provides for good and efficient operations. Well-kept property cultivates good neighbor relations with adjacent property owners. Housekeeping tasks may include collecting/disposing of litter or debris and maintaining access barriers.

2.2.9 Water Pollution Prevention Plan

Storm water during demolition will be managed in accordance with the Storm Water Pollution Prevention Plan (SWPPP) as follows:

URS understands and appreciates the importance of the SWPPP due to the present concerns and conditions of the Asarco facility. URS will utilize Best Management Practices (BMPs) for various construction activities. From the existing SWPPP, applicable information, such as management practices for the hazardous material storage

areas, will be incorporated into URS' Best Management Practices. Other material handling practices related specifically to the decontamination and demolition activities will be addressed. Management practices for cross-contamination control will be addressed, such as avoiding spills from construction vehicles during hauling, loading, servicing, and fueling and controlling contaminated soil erosion. Changes to the storm drainage system due to demolition will be addressed as the structures are demolished and the side conditions change.

Standard erosion control measures will also be utilized, including controlling dust, providing straw bales around storm drain inlets, placing sand-bags at critical perimeter locations, and avoiding off-site tracking of debris from vehicles. Provisions to avoid ponding and maintain excavations free of storm water runoff will be addressed. Typically, this will involve filling these locations prior to storms. Measures for erosion control will be added as the project progresses.

Inspection of the erosion control measures will be made prior to, during, and after storms to evaluate the adequacy of these measures and to manage corrections as necessary. Documentation of the inspection and correction activities will be maintained, as required. Generally, the inspection and documentation will be done by the Project Manager / Engineer. Copies of the documentation will be forwarded to Asarco for review and records.

2.2.10 Dust Control Plan

Dust control will be performed as follows:

The general requirements of this plan are to provide adequate resources to control dust and to detail the means and methods that will be utilized to implement dust control measures during the cleaning and demolition in order to support scheduled activities/operations within the Asarco facility. URS/CWC's dust control measures are designed to control the emission of visible fugitive nuisance dust. These controls will be accomplished through the use of administrative, engineering, and physical controls that will include, but not be limited to the following:

- Moistening surfaces with water
- Application of dust suppressants or encapsulates, where applicable
- Minimizing soil, road, and surface disturbances
- Minimize dusting exposure periods and wind erosion before dust-abatement measures are applied
- Curtailing of work activities during high wind conditions (over 15 MPH average hourly rate)
- Controlling vehicle/equipment speeds (10 MPH maximum)
- Restricting traffic to designated roads/corridors and
- Equipment Selection.

URS/CWC considers the mitigation of airborne dust generation to be a priority. Throughout the project, URS/CWC will take all necessary steps to effectively control dust in the working area during demolition operations. As previously mentioned, URS/CWC will remove at ground level and at all accessible areas all gross debris accumulation that could be a source of airborne dust. Furthermore, URS/CWC will institute a program of pre-wetting and moistening building interiors and horizontal surfaces where dust has accumulated. This pre-wetting of the structure interiors will limit the ability of remaining dust to become airborne during the demolition process. As the structures are demolished, the dust will be allowed to fall to the ground where it can be gathered, containerized appropriately, and properly managed.

2.2.10.1 Application with Water During Demolition

The use of water will be the main source for dust control. URS/CWC will keep all work areas (including roads, access points) within the facility, wet during work activities. This will be accomplished by using existing 2,000-gallon water trucks. Each water truck will be equipped with spray-bars for wetting haul and access roads; water cannons and necessary hoses, valves, and fittings will be used to provide spray water for dust control where needed in remote areas where a water truck can not be utilized.

Furthermore, during the life of the project water truck(s) will be available during the actual demolition of the above grade steel and concrete structures. Localized fine water spray pointed at the source of demolition (and therefore dust source) reduces dust particles to become airborne. Additionally, URS will utilize a Dust Boss™ water misting system. The Dust Boss™ is a fully automatic, oscillating ducted fan with a high pressure misting system that creates a high performance dust barrier. Dust Boss™ uses a high pressure misting system to create an ultrafine mist that attracts dust and drives the dust particles to the ground. During structure demolition, this equipment will be pre-positioned in an area that will ensure the generated dust barrier is effective. To minimize water run-off, both the water truck and Dust Boss™ water supply will be used only if necessary.

2.2.10.2 Dust Control During Loading and Debris Transport

During loading, unloading, and material transfer operations, URS/CWC will minimize material drop heights to reduce emission of fugitive dust. During loading of demolition debris, additional spray water will be utilized to control fugitive dust emissions from this operation. After demolition debris is loaded into the truck beds, URS/CWC will then moisten the debris payload down prior to the vehicle leaving the loading areas.

As described above, during debris transportation, URS/CWC will construct a truck moistening station at the exit of the Asarco site over to the CAMU site. This station will consist of a scaffolding platform on which personnel will mist water on the loaded debris as a final step before it travels outside the property fence line and across the County road. The spray will add a final moisture barrier/binder to the debris for the short distance to the CAMU. Transport vehicles will be limited to a maximum 10 miles per hour while both on-site and during transport. Limiting speeds will prevent dust from become airborne during transport and will prevent the kick-up of dust due to rolling tire action.

2.2.10.3 Dust Suppressant

The primary dust control measure to be used will be water. However, the application of an accepted dust suppressant dispersed from the water truck or special equipment as a dust suppressant may be required during periods of time that the application of water alone is

inadequate for dust control. Dust suppressant product information and MSDSs will be submitted for approval prior to the usage and/or application.

2.2.10.4 Area Control

URS/CWC will use specific loading areas for each decontamination/demolition removal location to minimize disturbances and control material transfer operations. During the demolition of each structure, URS/CWC will designate a staging and loading area directly adjacent to each structure. Often this area will be within the footprint of the structure being demolished. This staging and loading area, specific to each structure, will be kept constant and will be maintained to control the migration of dust and debris from moving material unnecessarily.

2.2.10.5 Water Source

URC/CWC will utilize the existing Asarco provided fill station, adjacent to Upper Lake, as the source of non-potable water to be utilized for dust suppression operations.

2.2.10.6 Field Quality Control

URC/CWC Project Staff (i.e., Project Superintendent, Foreman, H&SP) will inspect work areas daily to assess the need for implementation (or additional implementation) of dust control measures.

2.2.10.7 Overall Dust Control Application

URS/CWC will control fugitive dust emissions by using the following overall methods:

- Provide dust suppression (water) before, during, and after demolition of a structure, provided it is safe to do so.
- In cases where structures are to be dropped (stack demolition, elevated structures), URS/CWC will moisten the targeted drop area prior to the demolition of the structure.
- Provide dust control during material sizing and loading operations.
- Control material drop heights during loading, unloading and material transfer operations.
- Minimize and control material handling operations.
- On-site vehicular traffic control and haul road maintenance.

If necessary, URS/CWC will apply other approved methods for control of dust during specific procedures.

3.0 DEMOLITION FOOT PRINT EXPOSED AREA SOIL SAMPLING

Figure 2-1 and Exhibit 1 illustrate the seven (7) cleaning and demolition structure footprints, exposed soils sample areas. The proposed soil sample locations are also shown on Figure 2-1 and Exhibit 1.

3.1 EXISTING SOIL DATA

Surface and sub-surface soil data were presented in the Phase I RFI, Appendix 7 (ACI, 2003). The data include samples collected at surface soil sites, sub-surface boreholes, test pits, and monitoring wells.

Figure 3-1 shows arsenic profile data across the plant site. The profiles illustrate that arsenic is generally elevated in surface and near surface soils throughout the plant area. Arsenic generally decreases with depth.

The site wide soil summary statistics for the surface soils are shown in Table 3-1. The source of these data is the 2003 Phase I RFI (ACI, 2003). This table contains all RFI sample locations including:

- Unpaved on-plant areas
- Unpaved off-plant areas
- Former lower ore storage areas
- Former upper ore storage areas and
- Rail corridor areas.

The site wide soils summary statistics for unpaved (exposed) on-plant site areas are shown in Table 3-2. This soil sample group represents most of the demolition exposed soils sample areas.

3.2 EXPOSED SOIL AREA SAMPLING

As described in Section 2.0, Figure 2-1 and Exhibit 1 show the location of cleaning and demolition structures and exposed soil sample areas. As part of site surveys conducted in 2007, exposed soil areas within or adjacent to cleaning and demolition footprint areas were identified in the field and mapped. Figure 2-1 and Exhibit 1 show identified exposed soil areas. Prior to conducting the exposed soil sampling procedures (see Section 3.2.1), visually obvious dust (typically indicated by dark gray or black color and fine-grained silty texture) within demolition foot print areas will be removed.

3.2.1 Exposed Soil Area Sampling Methods

If exposed surface soil areas are encountered within the cleaning and demolition footprints, the exposed surface soil area will be sampled and analyzed for the following indicator parameters: arsenic, copper, cadmium, lead, zinc and selenium, and supplemental parameters: aluminum, antimony, barium, beryllium, chrome, cobalt, iron, manganese, mercury, nickel, silver thallium and vanadium using wet chemistry standard EPA methods. The soil sample collection and analytical matrix is summarized in Table 3-3. Based on known exposed soil areas, the proposed soil sample sites were identified and shown on Figure 2-1 and Exhibit 1.

3.2.1.1 Initial Exposed Surface Soil Characterization

A total of five surface (0-4 inch increment) soil samples will be collected from each sample site in identified exposed soil areas and composited into one representative sample of the area. Surface soil samples will be collected using hand tools (hand shovels, trowels, or hand augers). The samples will be stored in ziploc bags and archived for analysis. All analytical work will be conducted before the 6-month holding time limit for metals. The location of each soil sampling site will be cataloged using sample numbers and GPS coordinates. The sampling Standard Operation Procedures (SOPs), analytical parameters, and methods are summarized in Table 3-3. For convenience, the relevant SOPs from the IM and RFI work plans are contained within Appendix D of this Work Plan.

Surface soil samples will be collected from exposed soil areas using the same techniques and procedures used for Interim Measures (IM) and RCRA Facility Investigation (RFI) activities, as described in the IM and RFI Work Plans (Hydrometrics, 1999b and Hydrometrics, 2000).

3.2.1.2 Exposed Soil Subsurface Profile Sample Collection

Exposed area sub-surface soil profile samples will be collected at the depth intervals shown in Table 3-3 and analyzed for the indicator parameters arsenic, cadmium, copper, lead, zinc and selenium. Samples will be collected from test pits advanced using standard excavation equipment. The test pits will be advanced to standard excavation practical limits of 15 feet or until equipment refusal is encountered. Excavator equipment refusal is defined by the inability to advance the excavation in the event of encountering the groundwater table, or in the event hard boulder strata conditions prohibit the ability of the excavator to advance the test pit. Test pit subsurface soil samples will be analyzed using standard EPA wet chemistry methods (EPA Methods SW 6010/6020) at a commercial laboratory. The final interval samples will also be submitted to a commercial laboratory for definitive analysis using standard EPA wet chemistry methods.

The soil sample collection and analytical matrix is summarized in Table 3-3. As the table shows, initial and final samples will be analyzed for indicator parameters (As, Cd, Cu, Pb, Se, and Zn) and for supplemental parameters (Al, Sb, Ba, Be, Cr, Co, Hg, Fe, Mn, Ni, Ag, Tl, V). The final sample increment will also be analyzed using the Synthetic Precipitation Leachate Procedure (SPLP).

Sub-surface soil samples will be collected directly from the soil excavation equipment bucket in the following increments. Sub-surface soil increments are: 4 - 12", 1 - 2', 2 - 4', 4 - 6', 6 - 8', 8 - 10', 10 - 12', and 12 - 15'. One soil sample will be collected directly from the backhoe bucket for each increment within an identified exposed soil sample area.

Sub-surface soil samples will be collected from exposed soil areas using the same techniques and procedures used for Interim Measures (IM) and RCRA Facility Investigation (RFI) activities, as described in the IM and RFI Work Plans (Hydrometrics, 1999b and

Hydrometrics, 2000). Samples will be stored in ziploc bags and shipped to the laboratory for analysis.

Based on subsurface soil sample results, future additional sampling may be conducted. For example, if profile sampling shows a pattern of elevated metal concentrations through the 15 foot sampling profile, additional subsurface sample collection deeper into the saturated zone may be warranted. Following review and consultation with EPA of exposed demolition footprint exposed soil data, a supplemental soil sample collection program may be developed. The new soil profile data, as well as the existing sample soil data base will be considered (see Section 3.3 below). This program may be conducted under another 2008 Interim Measures Work Plan addendum, or included as part of the Phase II RFI Work Plan effort. It is anticipated any that additional soil data collected at intervals deeper than 15 feet and/or into the saturated zone would require collection using soil core drilling methods. Where possible, supplemental sampling would be conducted within the exposed area soil foot print. Where equipment access is limited, sampling would be conducted as close as feasible to the exposed soil sample foot print area. It is also anticipated that any supplemental soil sample program will be developed and executed in 2008.

3.3 2007 SOIL DATA COLLECTED IN THE THAW HOUSE AND MAIN OFFICE AREAS

Table 3-4 shows the results of the soil samples collected within the thaw house demolition footprint area and within the main office footprint area in the fall of 2007. In order to facilitate temporary capping, these areas were sampled to a maximum depth of 15 feet and submitted to the laboratory for analysis using wet chemistry techniques. The samples were collected and analyzed in accordance with the procedures summarized in Table 3-3 and described in Section 3.2.2 and 3.2.3 above. The analyses show a pattern of elevated soil metals at the surface with decreasing concentrations with depth.

A comparison of sample results (Table 3-4) with the site wide unpaved (exposed) on-plant site areas soil arithmetic mean concentrations (Table 3-2) show the thaw house soils at some locations (sample site TH-3 and TH-4) were above arithmetic mean concentrations for lead

and zinc in the 0 - 4" interval. However, three of the five sample sites (TH-1, TH-2 and TH-5) were well below arithmetic mean concentrations for unpaved (exposed) sample sites for all parameters at all sample intervals.

Soil samples were also collected from exposed soils within the main office building foot print (see Figure 2-1). Using excavation equipment, soil samples were collected from the main office area to a depth of 15 feet. A comparison of Table 3-4 (Main Office sample site MO-1) with unpaved the site wide unpaved (exposed) on-plant site areas soil arithmetic mean concentrations contained in Table 3-2, shows concentrations in the 0 - 4" increment are above the arithmetic mean concentrations for copper, lead and zinc. However, this interval has already been removed as part of the final cleaning and demolition process in the main office building foot print. As part of the final cleaning and demolition process, exposed soils below the main office foot print area were excavated to 6 feet below grade surface. The excavation was filled with slag and a temporary cap was installed to limit the potential for infiltration of precipitation and runoff within the main office foot print area. EPA was notified of these actions in the October 2007 and November 2007 monthly RCRA Consent Decree progress reports.

4.0 SCHEDULE

A preliminary schedule for cleaning and demolition of the blast furnace and Monier flue areas, and soil sampling project is in Figure 4-1. The schedule is preliminary and is dependent on the sequencing of several other cleaning and demolition projects that are addressed in the 2008 Cleaning and Demolition. Key events include:

- Construction of the CAMU
- Pre-demolition Cleaning
- Demolition of structures
- Stack demolition
- Flue demolition
- Flue dust removal and associated impacted soils from exposed soil areas
- Soil Sampling and
- Interim Cap.

5.0 REFERENCES

ASARCO LLC, 2007a. Asarco East Helena Smelter, 2007 Interim Measures Work Plan Addendum, Blast Furnace Flue and Monier Flue, Cleaning, Demolition and Soil Sampling Work Plan, May 5, 2007.

ASARCO LLC, 2007b. Asarco East Helena Smelter, 2007 Interim Measures Work Plan Addendum, Speiss-Dross and Thawhouse Areas, Soil Sampling, Excavation, Confirmation Sampling and Interim Capping Work Plan, September 25, 2007.

ASARCO LLC, 2008a. Asarco East Helena Smelter 2008 Interim Measures Work Plan Addendum, Demolition Foot Print Exposed Areas Soil Sampling, Excavation, and Confirmatory Sampling Work Plan and Blast Furnace Flue and Monier Flue Cleaning, Demolition and Soil Sampling Work Plan, February 6, 2008.

ASARCO LLC, 2008b. 2008 Cleaning and Demolition Project, Asarco East Helena Plant, May 12, 2008.

Asarco Consulting, Inc., 2003. Phase I RCRA Facility Investigation Report (revised 2005).

Hydrometrics, 2002. RCRA Interim Measures Work Plan Addendum (IMWPA). 2002.

Hydrometrics, 2000. RCRA Facility Investigation Work Plan, East Helena Facility, March 2000.

Hydrometrics, 1999a. RCRA Current Conditions/Release Assessment (CC/RA). 1999.

Hydrometrics, 1999b. Interim Measures Work Plan, East Helena Facility, April 1999, Revised July 1999. Includes Volume II, Corrective Action Management Unit Design Report.

URS, 2007. Work Plan, 2007 Cleaning & Demolition Project and CAMU Phase 2 Cell Project, Asarco East Helena Plant, East Helena, Montana, May 2007.

TABLE 2-1. PRIORITY OF MAINTENANCE TASKS

Priority	Type of Maintenance	Description and Example
1	Emergency	A situation requiring immediate attention (for example, fire or flood).
2	Preventative	Scheduled inspection and minor repairs carried out during inspection (for example, cleaning of membrane liner).
3	Corrective	Corrective maintenance required as a direct result of scheduled inspection (for example, repair of torn membrane liner).
4	Housekeeping	Routine housekeeping of buildings and grounds (for example, disposal of debris and general housekeeping).

TABLE 2-2. EMERGENCY NOTIFICATION CONTACTS AND PHONE NUMBERS

General Emergency Numbers:

Fire Department	911
Ambulance	911
Police	911

Corporate Resources

ASARCO LLC

Blaine Cox	(East Helena Smelter)	(406) 227-4098
	Cell	(406) 459-8542
Jon Nickel	(East Helena Smelter)	(406) 227-4529

OTHER RESOURCES:

U.S. EPA (24-hour emergency)	(206) 553-1263
Superfund/RCRA Hotline	(800) 424-9346
Hydrometrics, Inc	(406) 443-4150

TABLE 3-1. SITE WIDE SOIL SUMMARY STATISTICS FOR SURFACE SOILS

0"-4" Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	173/183	2159	1028	0.01	35500	SS-12	3753	16.5	26	432
COPPER (CU) TOT	175/183	5522	3225	0.01	35750	RC-SA02D-1, 4/24/2001	6917	16.3	69	1127
CADMIUM (CD) TOT	167/183	1225	354	0.05	23400	SS-18	2830	0.24	816	196
LEAD (PB) TOT	177/183	16615	10875	0.01	73866	RC-SS17, 4/18/01	17967	11.6	296	3439
ZINC (ZN) TOT	179/183	13672	7916	0.05	88519	RC-SS25, 4/25/01	17388	46.9	63	2940

4"-12" Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	144/155	1133	503	0.10	8753	RC-SS05C-2, 4/6/2001	1518	16.5	17	276
COPPER (CU) TOT	148/155	2624	1319	0.10	16054	RC-SS05C-2, 4/6/2001	3421	16.3	37	604
CADMIUM (CD) TOT	136/155	662	239	0.05	13992	RC-SS06, 4/06/01	1436	0.24	535	128
LEAD (PB) TOT	152/155	12717	7125	0.05	77220	RC-SS07D, 4/09/01	16583	11.6	210	2431
ZINC (ZN) TOT	153/155	9791	6263	0.05	57288	RC-SA06, 4/24/01	11284	46.9	53	2492

1'-2' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	148/154	825	338	0.03	9256	UOS-SS11-3, 10/3/2001	1405	16.5	13	209
COPPER (CU) TOT	148/154	1999	790	0.01	64908	UPS-SS01-3, 3/20/2001	5521	16.3	26	416
CADMIUM (CD) TOT	121/154	415	111	0.02	10110	RC-SS06, 4/06/01	980	0.24	303	73
LEAD (PB) TOT	152/154	8147	3219	0.03	64307	UPS-SS01, 3/20/01	11119	11.6	136	1574
ZINC (ZN) TOT	153/154	6552	4166	0.05	35772	RC-SS20, 4/18/01	7035	46.9	38	1795

2'-3' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	116/128	518	130	0.012	4455	RC-SS06-4, 4/6/2001	906	16.5	6	97
COPPER (CU) TOT	122/128	1130	396	0.004	6741	RC-SS08-4, 4/9/2001	1579	16.3	14	229
CADMIUM (CD) TOT	92/128	397	44	0.003	13588	RC-SS06, 4/06/01	1316	0.24	174	42
LEAD (PB) TOT	123/128	5153	1193	0.003	37460	LOS-SS06, 4/06/01	7888	11.6	60	696
ZINC (ZN) TOT	127/128	6070	1731	0.032	56395	LOS-SS05, 4/05/01	9052	46.9	21	979

3'-5' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	36/39	300	165	10.00	1608	UOS-SS05-5, 4/17/2001	407	16.5	7	115
COPPER (CU) TOT	39/39	671	286	21.00	5763	UOS-SS07-5, 4/17/2001	1051	16.3	15	239
CADMIUM (CD) TOT	28/39	202	51	5.00	1430	RC-SS07C, 4/9/01	349	0.24	203	49
LEAD (PB) TOT	39/39	3547	1885	27.00	15928	UOS-SS05, 4/17/01	4456	11.6	93	1078
ZINC (ZN) TOT	39/39	3159	1000	45.00	12826	LOS-SS10, 4/6/01	3904	46.9	21	980

5'-8' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	30/31	304	49	11.00	2553	RC-SA08A-5, 4/25/2001	592	16.5	4	73
COPPER (CU) TOT	31/31	715	116	17.00	6181	RC-SS27-6, 4/9/2001	1339	16.3	11	185
CADMIUM (CD) TOT	24/31	131	32	5.00	741	RC-SS27, 4/9/01	188	0.24	170	41
LEAD (PB) TOT	31/31	5463	1593	23.00	26889	RC-SS27, 4/9/01	7733	11.6	109	1267
ZINC (ZN) TOT	31/31	4987	1354	46.00	39575	RC-SA06, 4/24/01	8190	46.9	26	1219

8'-11' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	4/4	408	181	16.00	1255	RC-SA08B-8, 4/25/2001	570	16.5	10	160
COPPER (CU) TOT	4/4	779	669	44.00	1734	RC-SA08B-8, 4/25/2001	704	16.3	26	429
CADMIUM (CD) TOT	2/4	68	8	5.00	251	RC-SA08B, 4/25/01	122	0.24	68	16
LEAD (PB) TOT	4/4	1126	182	176.00	3962	RC-SA08B, 4/25/01	1891	11.6	34	390
ZINC (ZN) TOT	4/4	2531	360	138.00	9265	RC-SA08B, 4/25/01	4492	46.9	13	618

TOT = Total

1/2 the detection limit used for non-detected values.

All analytical values are in mg/Kg

Source: Table 2-3-1, Phase I RFI Report, ACI, 2003.

TABLE 3-2. SITE WIDE SOIL SUMMARY STATISTICS FOR UNPAVED (EXPOSED) ON-PLANT SITE AREAS

0"-4" Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geomean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	19/19	2174	460	0.10	17075		3970	16.5	19	315
COPPER (CU) TOT	19/19	5119	1100	0.10	35350		8806	16.3	44	709
CADMIUM (CD) TOT	18/19	662	433	0.05	3069	UPS-SS1, 3/20/01	954	0.24	1121	269
LEAD (PB) TOT	18/19	9024	8813	0.05	39046	UPS-SS4, 3/16/01	10263	11.6	281	3256
ZINC (ZN) TOT	18/19	12039	6421	0.05	84650	SS-31	21706	46.9	71	3318

4"-12" Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	16/18	678	349	0.10	2148		723	16.5	10	160
COPPER (CU) TOT	18/18	1970	754	0.10	9395		2673	16.3	20	326
CADMIUM (CD) TOT	16/18	224	88	0.05	901	UPS-SS1, 3/20/01	267	0.24	263	63
LEAD (PB) TOT	17/18	7345	4625	0.05	24682	UPS-SS6, 3/20/01	7703	11.6	114	1322
ZINC (ZN) TOT	17/18	9619	7874	0.05	41322	UPS-SS14, 3/20/01	11105	46.9	33	1548

1'-2' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	14/15	610	164	0.10	3100		941	16.5	7	119
COPPER (CU) TOT	15/15	5385	206	0.10	64908		16574	16.3	17	274
CADMIUM (CD) TOT	11/15	92	38	0.05	312	UPS-SS13, 3/20/01	102	0.24	117	28
LEAD (PB) TOT	14/15	8304	968	0.05	64307	UPS-SS1, 3/20/01	17002	11.6	73	846
ZINC (ZN) TOT	14/15	4921	1647	0.05	22123	UPS-SS12, 3/16/01	6868	46.9	15	722

2'-4' Depth Interval

Parameter	Detection Frequency	Arithmetic Mean	Median	Minimum	Maximum	Location of Maximum	Standard Deviation	Geo. Mean Background	Enrichment Factor	Geometric Mean
ARSENIC (AS) TOT	12/13	165	130	10	465		162	16.5	5	84
COPPER (CU) TOT	13/13	778	147	14	3522		1095	16.3	13	218
CADMIUM (CD) TOT	8/13	35	17	5	107	UPS-SS1, 3/20/01	35	0.24	80	19
LEAD (PB) TOT	13/13	2080	932	23	9636	UPS-SS13, 3/20/01	2884	11.6	52	598
ZINC (ZN) TOT	13/13	7881	532	15	41455	UPS-SS13, 3/20/01	13187	46.9	18	852

TOT = Total
1/2 the detection limit used for non-detected values.
All analytical values are in mg/Kg

Source: Table 2-3-3, Phase I RFI Report, ACI, 2003.

TABLE 3-3. DEMOLITION FOOTPRINT UNPAVED EXPOSED AREA SOIL SAMPLE COLLECTION AND ANALYTICAL MATRIX

Sample Location	Purpose	Sample Types and Depth Intervals[1]	Number of Sampling Events	Sampling Standard Operating Procedures	Analytical Parameters	Methods	Project Detection Limit Goal	Comment
Speiss-Dross and Thaw House Area (Area 1) (15 Sites) **Blast Furnace Flue Foot Print** (Area 3) (7 sites) **Monier Flue Foot Print** (Areas 3) (3 sites) **Blast Furnace Baghouse Area** (Area 2) (5 sites) **Acid Plant Stack Area** (Area 4) (2 sites) **Direct Smelt and Shop Area Cleaning and Demolition** (Area 6) (1 Sites) **Crushing Mill and Sample Mill Area** (Area 5) (3 sites)	Remove dust and impacted soils in exposed or unpaved areas within the structure demolition foot print.	Sample from Excavator Bucket. Sample intervals: 0-4" 4"-12" 1'-2' 2'-4' 4'-6' 6'-8' 8'-10' 10'-12' 12'-15'	1	HF-SOP-2 HF-SOP-4 HF-SOP-5 HF-SOP-7 HF-SOP-29 HF-SOP-31 HF-SOP-58 HS-SOP-6 HS-SOP-13 HS-SOP-57	Indicator Parameters (5) (All Depth Increments) As Cd Cu Pb Zn Se *Supplemental* Parameters (13) (Initial and Final Depth Increments Al Sb Ba Be Cr Co Hg Fe Mn Ni Ag Tl V	ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 EPA SW7471 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020	5 ppm 1 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 0.05 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm	Test pit sampling continues until the practical excavation limit is reached. Practical excavation limits are defined as: - Limit of common excavation equipment - 15 feet - Excavation equipment refusal because of hard strata or large boulders. - Entering the water table where caving strata do not allow advancement of test pit sampling to a depth of 15 feet. The final sample increment is retained and analyzed by wet chemistry for Indicator Parameters, Supplemental Parameters and SPLP.
Former Zinc Shop and Meeting Room Area (Area 7) (4 sites)	Document metal concentrations in test leachate from the SPLP testing procedure	Final increment sampled from excavator bucket and sampled for metals	1		As Cd Cu Pb Zn Se	SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312)	0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l	

(1) Sample depths are approximate; actual depths will based on field conditions.
Duplicates will be collected at a minimum frequency of 1 per 20 field samples. Duplicates for SPLP analysis will be submitted at a frequency of 1 per 20 samples selected for SPLP.
Detection limits for SPLP analysis have been set at 100x below regulatory limits.
Sample site locations will be surveyed by GPS during or after samples are collected.

TABLE 3-4. EXPOSED SOIL SAMPLE DATA COLLECTED IN THE THAW HOUSE AND MAIN OFFICE BUILDING DEMOLITION FOOT PRINTS

Site/ Sample #	Sample Interval (ft)	Sample Date (m/d/y)	Sample Time (hr/min/sec)	Description Interval (ft)	Analytical Parameters	As (mg/kg)	Cd (mg/kg)	CU (mg/kg)	Pb (mg/kg)	Zn (mg/kg)
TH1										
	A1	10/01/07	10:45	0-4"	Total Metals	70	300	160	310	4000
	B1	10/01/07	10:45	4-12"	Total Metals	<5	50	9	27	1400
	C1	10/01/07	10:45	1-2'	Total Metals	65	54	68	460	1200
	D1	10/01/07	10:45	2-4'	Total Metals	18	9	14	77	270
	E1	10/01/07	10:45	4-6'	Total Metals	17	4	12	20	120
	F1	10/01/07	10:45	6-8'	Total Metals	6	1	12	<5	37
	G1	10/01/07	10:45	8-10'	Total Metals	<5	1	11	<5	29
	H1	10/01/07	10:45	10-12'	Total Metals	11	2	36	<5	37
	I1	10/01/07	10:45	12-15'	Total Metals	7	2	20	<5	45
	I1	10/01/07	10:45		SPLP	<0.5	<1	<0.5	<0.1	<0.5
TH2										
	A1	10/01/07	12:00	0-4"	Total Metals	250	170	330	3500	3200
	B1	10/01/07	12:00	4-12"	Total Metals	<5	<1	5	<5	33
	C1	10/01/07	12:00	1-2'	Total Metals	34	8	23	110	220
	D1	10/01/07	12:00	2-4'	Total Metals	13	2	14	74	62
	E1	10/01/07	12:00	4-6'	Total Metals	<5	<1	<5	<5	35
	F1	10/01/07	12:00	6-8'	Total Metals	17	2	12	65	72
	G1	10/01/07	12:00	8-10'	Total Metals	16	2	10	14	47
	H1	10/01/07	12:00	10-12'	Total Metals	10	2	12	33	43
	I1	10/01/07	12:00	12-15'	Total Metals	26	2	21	8	39
	I1	10/01/07	12:00		SPLP	<0.5	<1	<0.5	<0.1	<0.5
TH3										
	A1	10/01/07	13:05	0-4"	Total Metals	630	620	1900	260000	17000
	B1	10/01/07	13:05	4-12"	Total Metals	77	52	100	1300	1400
	C1	10/01/07	13:05	1-2'	Total Metals	15	3	9	83	78
	D1	10/01/07	13:05	2-4'	Total Metals	9	15	19	410	340
	E1	10/01/07	13:05	4-6'	Total Metals	<5	5	6	56	130
	F1	10/01/07	13:05	6-8'	Total Metals	7	12	20	350	340
	G1	10/01/07	13:05	8-10'	Total Metals	<5	3	10	79	98
	H1	10/01/07	13:05	10-12'	Total Metals	<5	10	14	270	320
	I1	10/01/07	13:05	12-15'	Total Metals	<5	1	9	25	63
	I1	10/01/07	13:05		SPLP	<0.5	<1	<0.5	<0.1	<0.5
TH4										
	A1	10/01/07	13:50	0-4"	Total Metals	130	380	370	13000	13000
	B1	10/01/07	13:50	4-12"	Total Metals	17	46	73	1500	1800
	C1	10/01/07	13:50	1-2'	Total Metals	<5	12	7	390	340
	D1	10/01/07	13:50	2-4'	Total Metals	<5	<1	<5	180	81
	E1	10/01/07	13:50	4-6'	Total Metals	10	1	11	6	51
	F1	10/01/07	13:50	6-8'	Total Metals	10	1	11	<5	51
	G1	10/01/07	13:50	8-10'	Total Metals	8	1	9	<5	44
	H1	10/01/07	13:50	10-12'	Total Metals	9	2	9	11	60
	I1	10/01/07	13:50	12-15'	Total Metals	<5	<1	8	<5	46
	I1	10/01/07	13:50		SPLP	<0.5	<1	<0.5	<0.1	<0.5
TH5										
	A1	10/01/07	14:10	0-4"	Total Metals	120	190	220	1800	2300
	B1	10/01/07	14:10	4-12"	Total Metals	32	11	26	340	490
	C1	10/01/07	14:10	1-2'	Total Metals	15	12	<5	<5	72
	D1	10/01/07	14:10	2-4'	Total Metals	11	6	10	26	99
	E1	10/01/07	14:10	4-6'	Total Metals	13	1	11	<5	47
	F1	10/01/07	14:10	6-8'	Total Metals	8	1	7	<5	39
	G1	10/01/07	14:10	8-10'	Total Metals	11	21	12	43	300
	H1	10/01/07	14:10	10-12'	Total Metals	8	1	10	<5	44
	I1	10/01/07	14:10	12-15'	Total Metals	7	2	10	<5	43
	I1	10/01/07	14:10		SPLP	<0.5	<1	<0.5	<0.1	<0.5
MO1										
	A1	09/26/07	14:30	0-4"	Total Metals	1500	310	5900	18000	6300
	B1	09/26/07	14:30	4-12"	Total Metals	120	28	160	790	390
	C1	09/26/07	14:30	1-2'	Total Metals	57	23	170	350	500
	D1	09/26/07	14:30	2-4'	Total Metals	71	15	200	800	320
	E1	09/26/07	14:30	4-6'	Total Metals	81	29	220	1200	590
	F1	09/26/07	14:30	6-8'	Total Metals	56	19	140	640	330
	G1	09/26/07	14:30	8-10'	Total Metals	22	5	52	140	91
	H1	09/26/07	14:30	10-12'	Total Metals	17	4	48	61	58
	I1	09/26/07	14:30	12-15'	Total Metals	19	3	64	27	61
	I1	09/26/07	14:30		SPLP	ND	ND	ND	ND	ND

NORTH

SCALE

0 200 1

LEGEND

PREVIOUSLY DEMOLISHED STRUCTURES

EXISTING STRUCTURES

SLURRY WALL

STRUCTURES SCHEDULED FOR DEMOLITION IN 2008

UNPAVED AREAS

DEMOLITION FOOTPRINT SAMPLE AREA

MO1 AREA 1 SAMPLE SITE - COLLECTED FALL 2007

UNPAVED DEMOLITION AREA FOOTPRINT SAMPLE SITE RECENTLY DISCOVERED

DH-41 EXISTING RI OR RFI SAMPLE SITE

DEMOLITION STRUCTURE EXPOSED FOOTPRINT SAMPLE AREAS

1 SPEISS-DROSS / THAWHOUSE AREA

2 BLAST FURNACE BAGHOUSE AREA

3 BLAST FURNACE FLUE & MONIER FLUE AREA

4 ACID PLANT CONTACT AREA

5 CRUSHING AND SAMPLE MILL AREA

6 MAINTENANCE SHOP AND DIRECT SMELT BUILDING AREA

7 FORMER ZINC PLANT AREA

BLAST FURNACE FLUE AND MONIER FLUE CLEANING & DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

CLEANING AND DEMOLITION FOOT PRINT EXPOSED SOIL SAMPLE AREAS

FIGURE 2-1

UPDATE TIME: 10:27AM
JSD\HEL\050608\I:\Land Projects\705402\dwg\705402H025.dwg

Hydrometrics, Inc.
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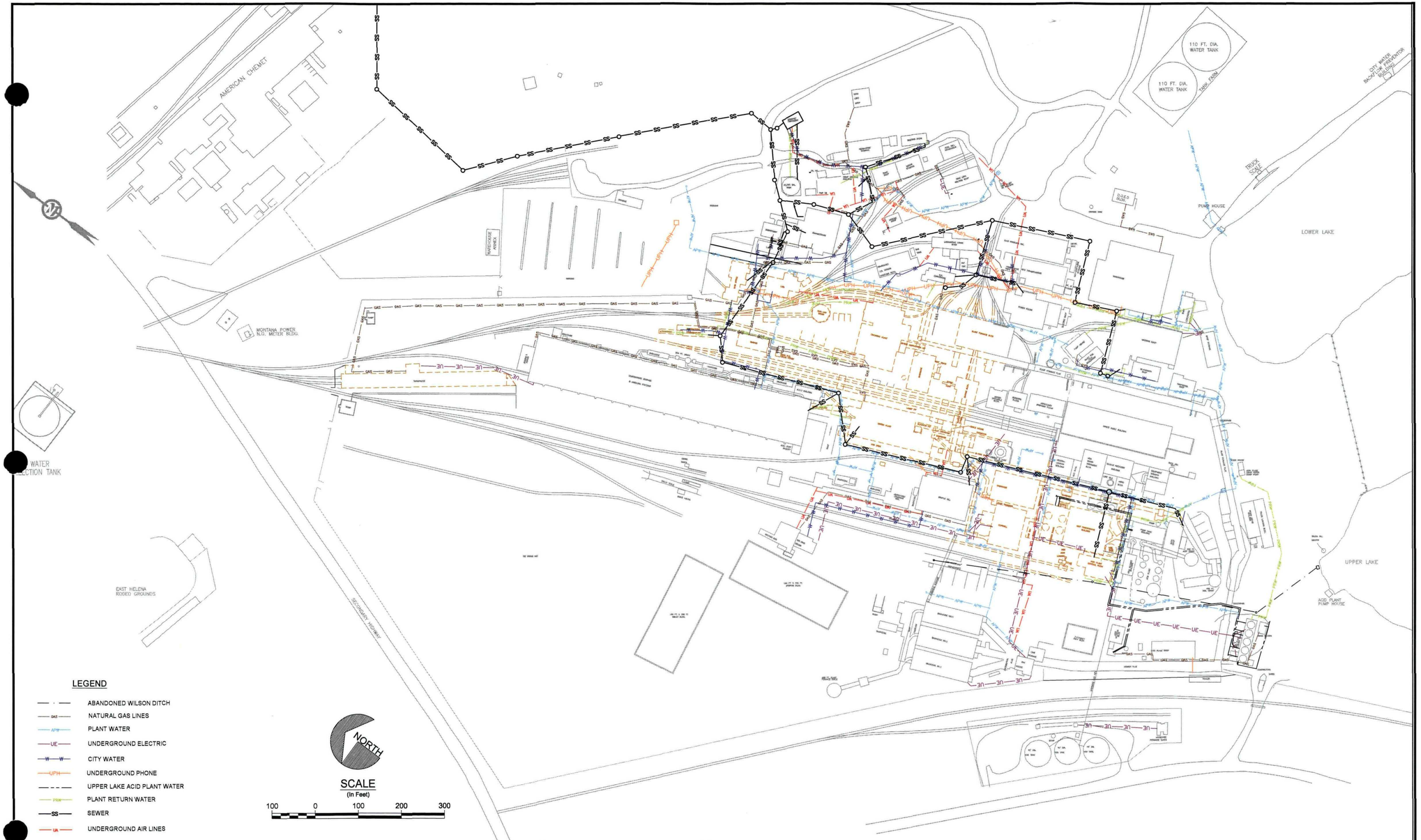

LEGEND

- ABANDONED WILSON DITCH
- NATURAL GAS LINES
- PLANT WATER
- UNDERGROUND ELECTRIC
- CITY WATER
- UNDERGROUND PHONE
- UPPER LAKE ACID PLANT WATER
- PLANT RETURN WATER
- SEWER
- UNDERGROUND AIR LINES

NORTH

SCALE
(In Feet)

100 0 100 200 300

REVISIONS NO	BY	DATE	DESCRIPTION

REVISIONS NO	BY	DATE

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Project No.: 7054		
DRAWN BY	GWL	1/19/07
CHECKED BY	MWR	1/19/07
APPROVED BY	MJO	1/24/07
SCALE: 1"=100'		

Hydrometrics, Inc.
Consulting Scientists and Engineers
Helena, Montana 59601
3020 Bozeman Avenue
(406) 449-4160

BLAST FURNACE FLUE AND MONIER FLUE CLEANING & DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

UNDERGROUND UTILITIES ABANDONED

DRAWING FILE NUMBER
705403H016.dwg
AUTOCAD 2004 DRAWING (DWG)
FIGURE 2-2
REV

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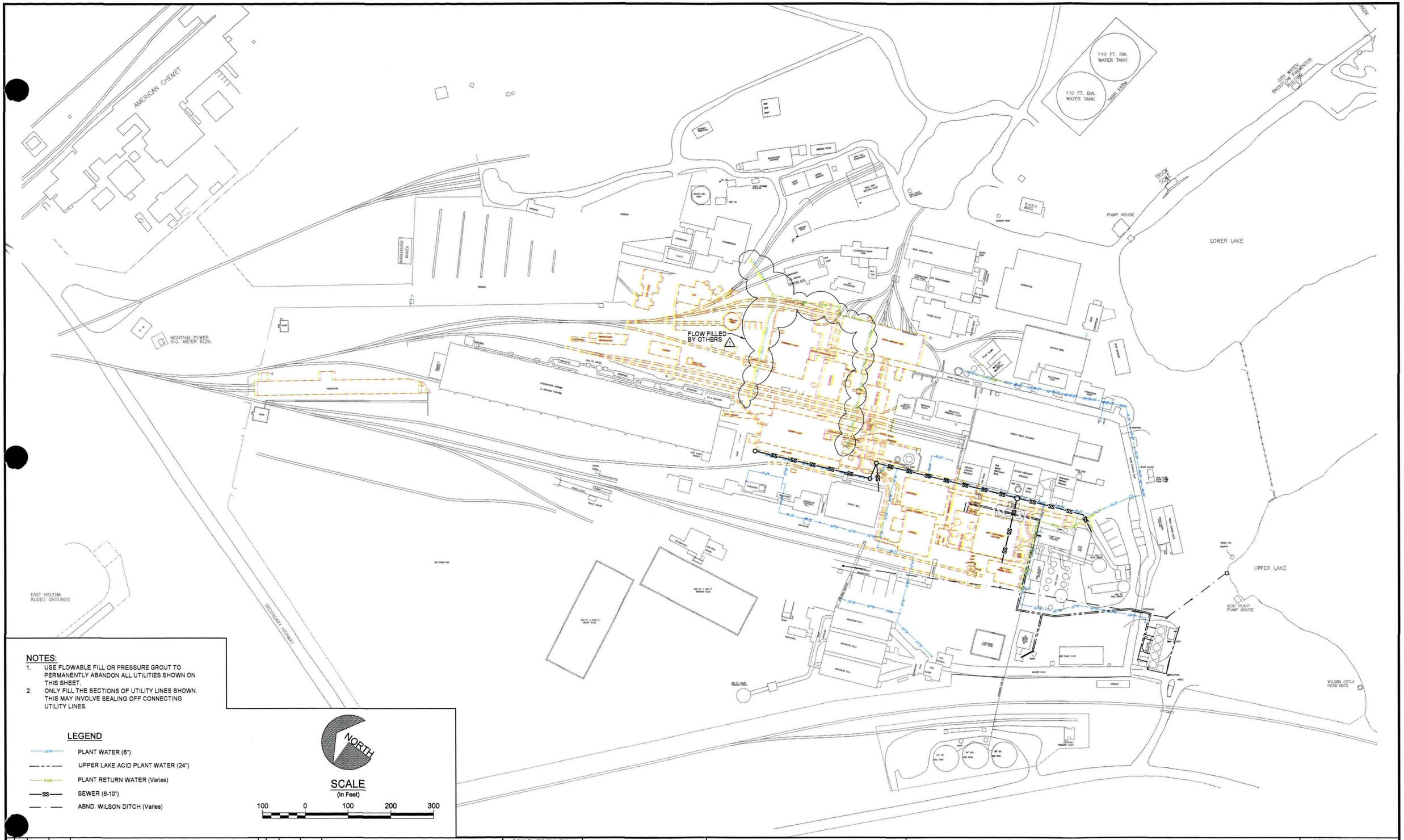

NOTES:

1. USE FLOWABLE FILL OR PRESSURE GROUT TO PERMANENTLY ABANDON ALL UTILITIES SHOWN ON THIS SHEET.
2. ONLY FILL THE SECTIONS OF UTILITY LINES SHOWN. THIS MAY INVOLVE SEALING OFF CONNECTING UTILITY LINES.

LEGEND

- APW — PLANT WATER (6")
- — — — UPPER LAKE ACID PLANT WATER (24")
- PRW — PLANT RETURN WATER (Varies)
- SS — SEWER (6-10")
- — · — ABND. WILSON DITCH (Varies)

REVISIONS NO	BY	DATE	DESCRIPTION

REVISIONS NO	BY	DATE

SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

Project No.: 7054		
DRAWN BY	GWL	1/19/07
CHECKED BY	MWR	1/19/07
APPROVED BY	MJO	1/24/07
SCALE: 1"=100'		

Hydrometrics, Inc.
Consulting Scientists and Engineers
Helena, Montana 59601
3020 Bozeman Avenue
(406) 449-4160

BLAST FURNACE FLUE AND MONIER FLUE CLEANING & DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

UNDERGROUND UTILITIES TO BE FLOW FILLED

DRAWING FILE NUMBER: 705403H017.dwg
AUTOCAD 2004 DRAWING (DWG)
FIGURE: 2-3
REV: △

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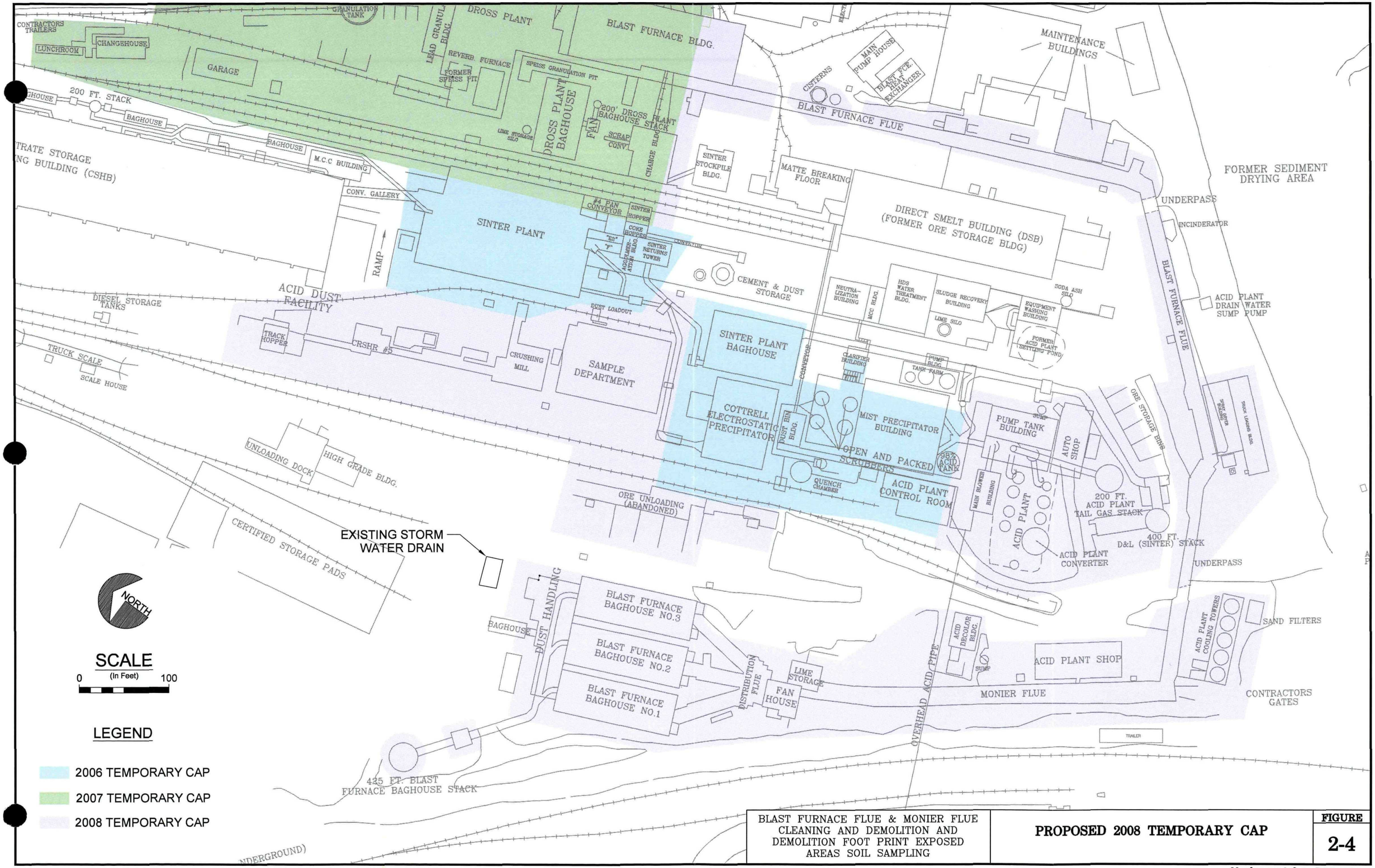

BLAST FURNACE FLUE & MONIER FLUE CLEANING AND DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

PROPOSED 2008 TEMPORARY CAP

FIGURE 2-4

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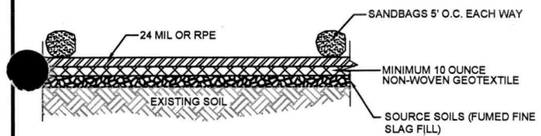
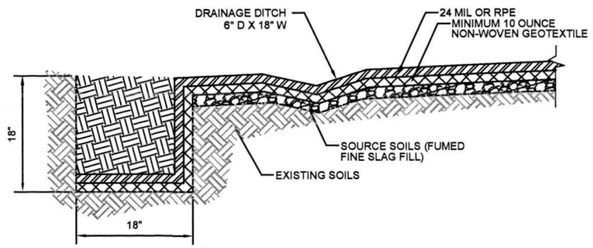
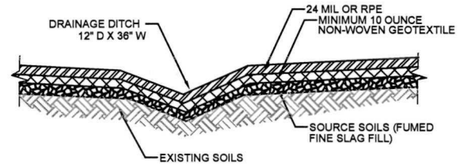


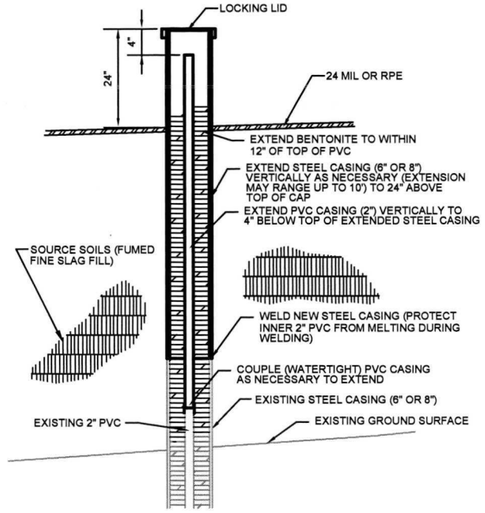
1/22 DETAIL
TEMP CAP
SCALE: NTS



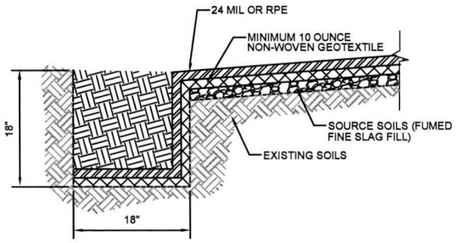
2/22 DETAIL
LINER ANCHOR TRENCH WITH DRAINAGE DITCH
SCALE: NTS



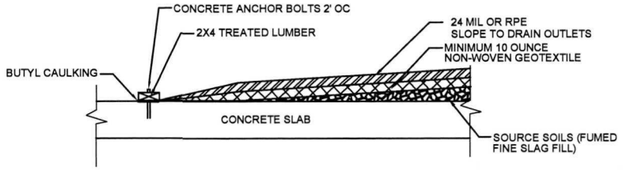
3/22 DETAIL
LINER DRAINAGE DITCH (TYP)
SCALE: NTS



10/22 DETAIL
MONITORING WELL EXTENSION
SCALE: NTS



4/22 DETAIL
LINER ANCHOR TRENCH
SCALE: NTS



5/22 DETAIL
LINER CONCRETE ANCHOR
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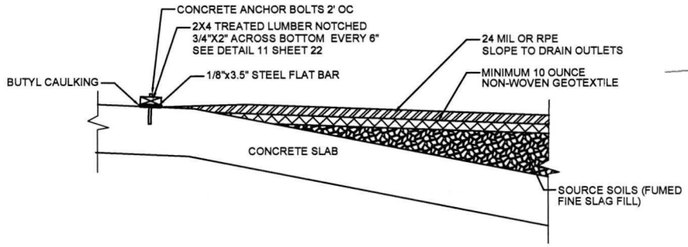

6/22 DETAIL
RUN-ON LINER/CONCRETE ANCHOR
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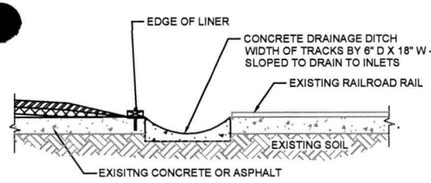

7/22 DETAIL
CONCRETE DRAINAGE DITCH
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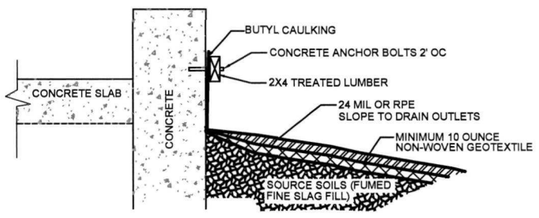
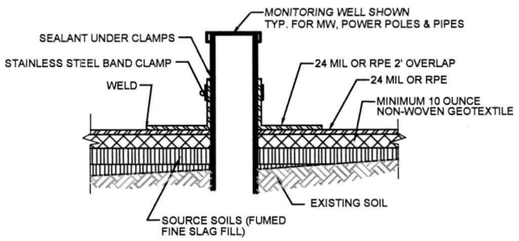
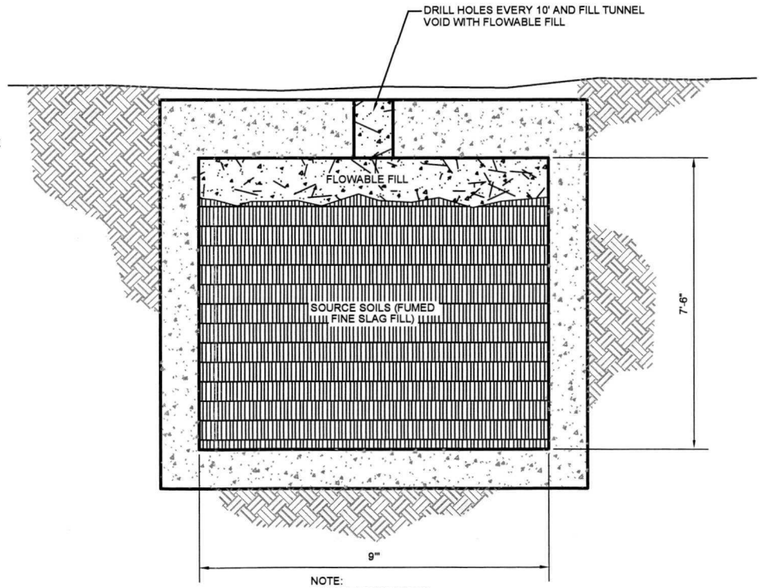


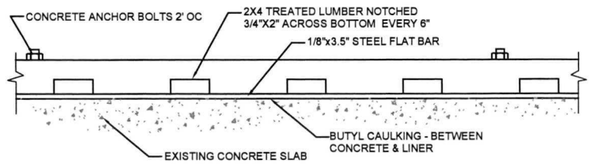
8/22 DETAIL
LINER WALL/FOUNDATION ANCHOR
SCALE: NTS



9/22 DETAIL
PROTRUSION & LINER CONNECTION (TYP)
SCALE: NTS



SECTION A/22 TUNNEL DETAIL
SCALE: NTS



11/22 DETAIL
RUN-ON ANCHOR DETAIL
SCALE: NTS

BLAST FURNACE FLUE & MONIER FLUE CLEANING AND DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS SOIL SAMPLING

TEMPORARY CAP DETAILS

FIGURE 2-5

UPDATE TIME: 1:41PM
JSD\HEL\050708\I:\Land Projects\705402\dwg\705402H028.dwg

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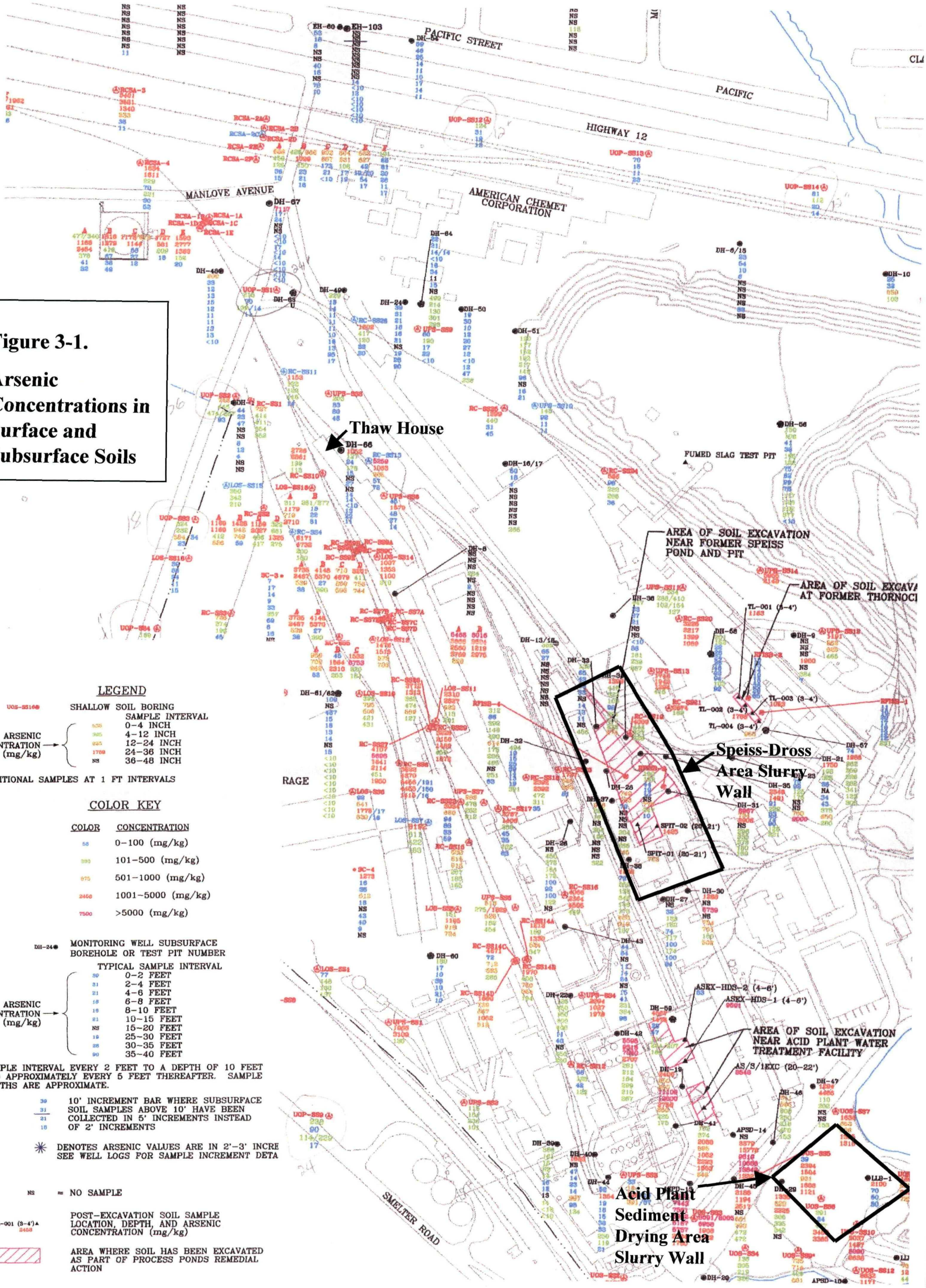
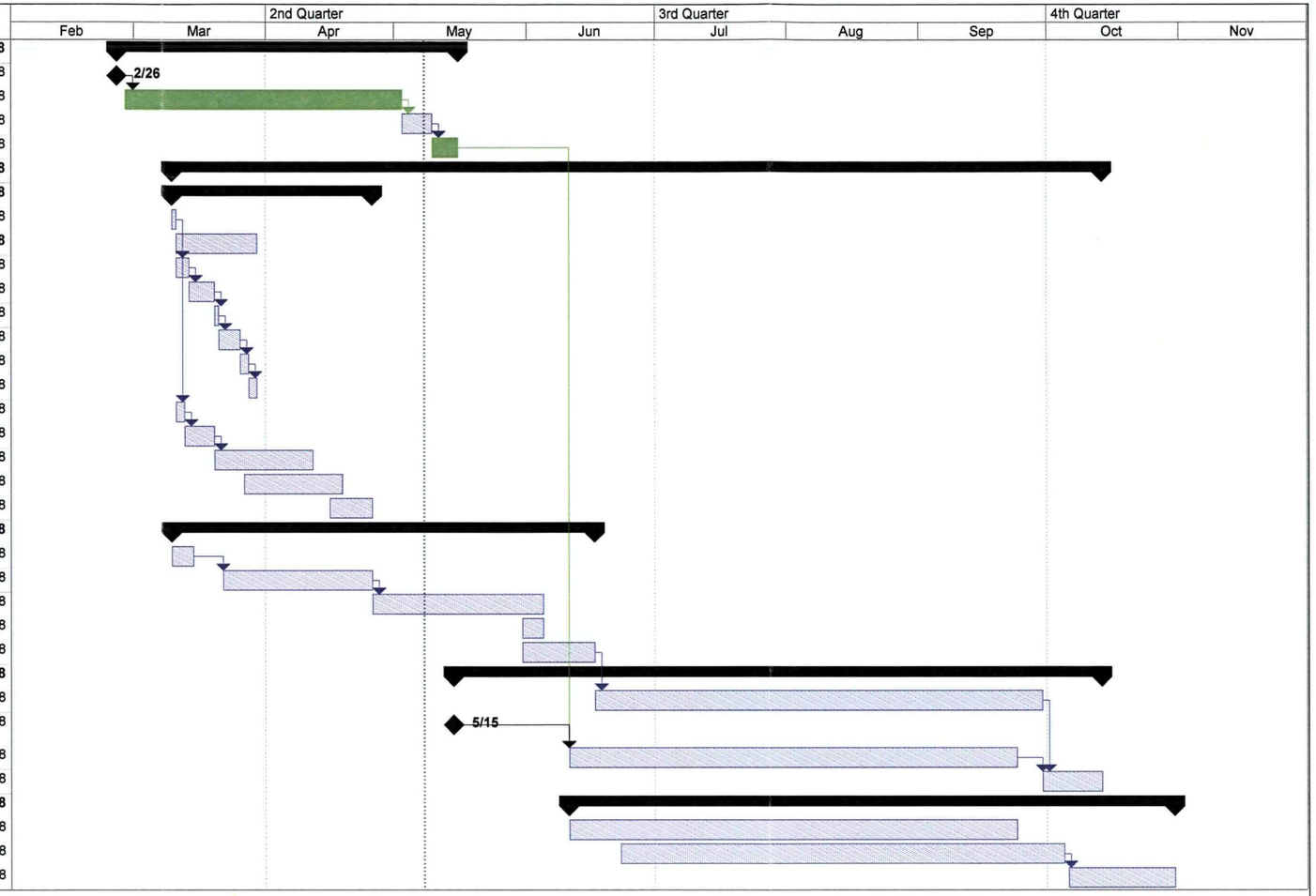
Figure 3-1.

Arsenic Concentrations in Surface and Subsurface Soils



ID	Task Name	Duration	Start	Finish
1	**Demo-Footprint Exposed Soil Sampling, and Cleaning and Demolition Work Plan**	**69 days**	**Tue 2/26/08**	**Thu 5/15/08**
2	Report to EPA	0 days	Tue 2/26/08	Tue 2/26/08
3	EPA Review and Comment	56 days	Thu 2/28/08	Fri 5/2/08
4	Response to Comments and Revisions	6 days	Sat 5/3/08	Fri 5/9/08
5	EPA Approval of Sampling and Demolition Plan	5 days	Sat 5/10/08	Thu 5/15/08
6	**2008 Demo & CAMU Excavation - March 10, 2008 START**	**187 days**	**Mon 3/10/08**	**Mon 10/13/08**
7	**Phase I - CAMU Construction**	**41 days**	**Mon 3/10/08**	**Fri 4/25/08**
8	Mobilization (To Be Determined)	1 day	Mon 3/10/08	Mon 3/10/08
9	**Roadway Construction and Paving**	**17 days**	**Tue 3/11/08**	**Sat 3/29/08**
10	Strip Topsoil	3 days	Tue 3/11/08	Thu 3/13/08
11	Roadway Cuts/Fills	5 days	Fri 3/14/08	Wed 3/19/08
12	Install Culvert	1 day	Thu 3/20/08	Thu 3/20/08
13	Place Base Course	4 days	Fri 3/21/08	Tue 3/25/08
14	Build Gravel Access Road	2 days	Wed 3/26/08	Thu 3/27/08
15	Asphalt Paving	2 days	Fri 3/28/08	Sat 3/29/08
16	Install Silt Fence	2 days	Tue 3/11/08	Wed 3/12/08
17	Strip Topsoil	6 days	Thu 3/13/08	Wed 3/19/08
18	Excavation and Stockpile	20 days	Thu 3/20/08	Fri 4/11/08
19	Screen Clay Material	20 days	Thu 3/27/08	Fri 4/18/08
20	Install Compacted Clay Liner	9 days	Wed 4/16/08	Fri 4/25/08
21	**Phase II CAMU Construction**	**85 days**	**Mon 3/10/08**	**Mon 6/16/08**
22	Liner Submittals and Approvals	5 days	Mon 3/10/08	Fri 3/14/08
23	Order Liner Materials, Manufacturing, and Delivery	30 days	Sat 3/22/08	Fri 4/25/08
24	Liner Installation	34 days	Sat 4/26/08	Wed 6/4/08
25	Install Leachate Drainage System	4 days	Sat 5/31/08	Wed 6/4/08
26	Install Imported Cushion Material	14 days	Sat 5/31/08	Mon 6/16/08
27	**Phase III CAMU Operation and Site Demolition**	**130 days**	**Thu 5/15/08**	**Mon 10/13/08**
28	Waste Placement	90 days	Tue 6/17/08	Mon 9/29/08
29	Authorization to Start Demolition Project (no later than May 15)	0 days	Thu 5/15/08	Thu 5/15/08
30	2008 Demolition	90 days	Wed 6/11/08	Tue 9/23/08
31	CAMU Temporary Cover	12 days	Tue 9/30/08	Mon 10/13/08
32	**Blast Furnace Flue and Monier Flue Cleaning and Demolition and Exposed Area Soil Sampling**	**122 days**	**Wed 6/11/08**	**Thu 10/30/08**
33	2008 Demolition	90 days	Wed 6/11/08	Tue 9/23/08
34	Soil Profile Characterization	90 days	Mon 6/23/08	Sat 10/4/08
35	Temporary Cover in Demolition Foot Print Areas	22 days	Mon 10/6/08	Thu 10/30/08



Project: Cover System Design
Date: Thu 5/8/08

Task | Progress | Summary | External Tasks | External Milestone
Split | Milestone | Project Summary | External Milestone | Deadline

Figure 4-1. Project Schedule

APPENDIX A

HAZARDOUS MATERIALS ABATEMENT PLAN

HAZARDOUS MATERIALS ABATEMENT PLAN

ASBESTOS CONTAINING MATERIALS AND LEAD DUST CLEANING ASSOCIATED WITH THE ASARCO PHASE 4 BUILDING CLEANING AND DEMOLITION

Submitted to:

Cleveland Wrecking Company
628 E. Edna PI.
Covina, California 91723

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Spokane WA. 99216

April 16, 2007

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Appendices

1.0 Introduction

1) IRS Environmental of WA (IRSE) has been contracted by Cleveland Wrecking Company, to abate hazards associated with the asbestos-containing materials (ACMs) that were identified in the structures and lead dust cleaning before selective demolition of the Asarco Lead Smelter Plant, located in East Helena, Montana.

2) This work plan describes the methods and procedures IRSE shall utilize to remove the subject ACM and lead dust. Sections 2.0 through 7.0 describe the applicable standards and regulations, site supervision, removal procedures and waste handling, WISHA air monitoring and the laboratory analytical procedures for each building scheduled for ACM abatement and/or lead dust cleaning. Appendix A of this work plan identifies the specific scope of work for each building scheduled for asbestos abatement and/or lead dust cleaning.

3) This plan is intended to address removal of ACM and lead dust cleaning from the subject structures.

2.0 Asbestos Abatement and Lead Dust Cleaning- Applicable Standards and Guidelines

1) Asbestos abatement work under this contract will be performed in accordance with all federal, state, and local laws, regulations, standards, and codes governing asbestos abatement. Before starting work, IRSE will provide proper notification Montana Department of Environmental Quality (DEQ).

3) IRSE will comply with all provisions of the Montana Asbestos Work Practices and Procedures Manual adopted and incorporated by the reference in the administrative Rules of Montana, Title 17, Chapter 74 Subchapter 3 as it pertains to safety in employment and the applicable provisions of DEQ General Safety and Health Standards as it pertains to occupational safety and health in the workplace. In addition, IRSE will comply with Title 29 CFR 1910 and 1926. The most recent edition of any regulation, standards, document, or code will be in effect. When conflict among the requirements or with this work plan exists, the more stringent requirement(s) will be applied.

   In addition, IRSE will comply with all provisions of the Federal OSHA standards applicable to construction work where employees may be exposed to lead (Title 29 CFR 1910 and 1926.62). The most recent edition of any regulation, standards, document, or code will be in effect. When conflict among these requirements or with this work plan exists, the more stringent requirement(s) will be applied.

4) Initial exposure assessments will also be conducted at the beginning of all abatement activities in accordance with Title 29 CFR 1926.1101.

3.0 Site Supervision and Certification

1) IRSE is a licensed asbestos abatement contractor in the State of Montana. All work will be supervised by Mark Kazemba, a state-certified Asbestos Supervisor and has completed the 40 hour hazwoper training. All supervisors are AHERA trained competent persons.

2) Supervisory duties will include, but will not be limited to, controlling site access and implementing proper air sampling protocols, as well as appropriate controls to prevent exposure to ACMs and lead. It is also the competent person's responsibility to ensure adequacy of engineering controls and to exercise the authority to select appropriate control strategies up to and including shutdown of the work if conditions are warranted.

3) All workers conducting ACM removal activities will be medically qualified and trained for asbestos work involving respirator usage.

4) All workers conducting lead dust cleaning will be medically qualified and trained for lead removal work involving respirator usage.

4.0 Site Safety and Health Plan

4.1 General

1) IRSE will be responsible for safety and health at the Asarco Phase 4 Building Cleaning and Demolition Project during anticipated asbestos abatement and lead cleaning activities. This includes, but is not limited to, electrical safety, equipment operation safety, mechanical (tool) safety, fire safety, and personnel protective equipment safety.

2) The *IRSE Site Specific Hazard Analysis* plan for the Asarco Phase 4 Building Cleaning and Demolition Project (see Appendix D) was developed to be used in conjunction with this Asbestos and Lead Dust Abatement Work Plan. Information found in this Work Plan, including air sampling, decontamination procedures, and work activities should be used to supplement the information contained in the *IRSE Site Specific Hazard Analysis Plan for the Asarco Phase 4 Building Cleaning and Demolition Project.* (see Appendix D).

4.2 Work Site Safety

1) Before initiating asbestos or lead cleaning abatement work, IRSE will set and post emergency procedures in a conspicuous place at each active abatement site. The emergency procedures will include provisions for the following:

   - Evacuation of injured workers
   - Emergency and fire egress routes from all work areas, including local telephone numbers for fire and medical emergency personnel, site of hospital routing maps
   - Copies of applicable insurance certificates
   - Entry logs.

2) At a minimum, two IRSE personnel with the proper training and certified in basic first aid and cardiopulmonary resuscitation (FA/CPR) will be at each active work site. A general first aid kit will be maintained in the support area for treating minor medical problems.

4.2.1 Work Area Access

Removal work areas will be clearly marked with barrier tape or other means to warn personnel of the hazards. Immediately adjacent to the removal work area (regulated work areas) a decontamination area for equipment and personnel will be established. The remainder of the IRSE project area will be designated as the support zone. No special markings or warning labels are required for this area.

4.2.2 Hazard Briefing/Site Safety Operation

1) No person will be allowed on the site during active abatement activities without first being given a site hazard briefing. In general, the briefing will consist of a review of the Work Plan and the tailgate safety meeting. All persons on the site, including visitors, must sign the site-specific tailgate safety meeting form. Tailgate safety meetings shall be held prior to the start of any work activities involving all personnel on site.

4.2.3 Entry Log

1) The IRSE Competent Person shall record the names and times of entry and exit of all personnel who enter the asbestos removal and lead dust cleaning work areas (regulated work area).

4.2.4 Entry Requirements

1) Entry into regulated work areas shall be only by personnel authorized by the State Certified Supervisor, Competent Persons, and Personnel authorized to enter regulated work areas shall be trained and medically evaluated and shall wear the PPE required.

2) IRSE will be responsible for the security of the work areas of the building(s) involved in the abatement project and secure all assigned entrances and exits at the end of the work day so as to prevent unauthorized entry.

3) The tailgate safety meeting log will be maintained and reflect the name of any and personnel attending.

4.3 Worker Protection Requirements

4.3.1 General

1) Danger signs and tape will be posted and meet the specifications of DEQ and OSHA Construction Standards wherever regulated work areas are created. Signs will be posted at a distance sufficiently far enough away from the work area to permit an employee to read the sign and take the necessary protective measures to avoid exposure.

2) Electrical power systems located in active abatement areas are de-energized, shut down and locked out and temporary power and lighting sources (if applies) will be provided to the area. The temporary power will be installed in a manner that is consistent with all applicable electrical code, WISHA, OSHA, and IT requirements for temporary electrical systems (if applies).

3) A sufficient quantity of negative pressure ventilation units equipped with HEPA filtration and operated in accordance with ANSI 29.2 through 79 (local exhaust ventilation requirements) shall be utilized when needed to provide adequate ventilation, or to provide four air changes per hour inside negative pressure enclosures.

4.3.2 Asbestos Abatement Training

1) Training shall be provided to all employees or agents who may be required to disturb asbestos for abatement and auxiliary purposes and to supervisory personnel who may be involved in planning, execution, design, or inspection of abatement projects. Asbestos abatement workers and supervisors must have successfully completed Montana State approved training courses and have state certification cards on site at all times when working. Inspection undertaken to determine the presence of additional asbestos will be conducted by personnel who are currently EPA Certified Building Inspectors. Project design personnel will also be EPA certified. Worker and supervisory certificates and training documentation.

2) Worker training shall provide, at a minimum, information on the following topics:

- The health hazards of asbestos, including the nature of various asbestos-related diseases, routes of exposure, known dose-response relationships, the synergistic relationship between asbestos exposure and cigarette smoking, latency periods for disease and health basis for standards.

- The physical characteristics of asbestos, including fiber size, aerodynamic properties, physical appearance, and uses.

- Employee PPE, including the types and characteristics of respirator classes, limitations of respirators, proper selection, inspection, donning, use, maintenance and storage of respirators, field testing the face-piece-to-face seal (positive and negative pressure fitting tests), qualitative and quantitative fit testing procedures, variations between laboratory and field fit factors, factors that affect respirator fit (e.g., facial hair), selection and use of disposable clothing, use and handling of launderable clothing, nonskid shoes, gloves, eye protection, and hard hats.

- Medical monitoring requirements for workers include required and recommended tests, reasons for medical monitoring, and employee access to records.

- Air monitoring procedures and requirements for workers, including description of equipment and procedures, reasons for monitoring, types of samples, and current standards with recommended changes.

- Work practices for asbestos abatement include proper construction and maintenance of air-tight plastic barriers, job set-up of airlocks, worker decontamination systems and waste transfer airlocks, posting of warning signs, engineering controls, electrical and ventilation system lockout, proper working techniques, waste cleanup and disposal procedures.

- Personal hygiene, including entry and exit procedures for the work area, use of showers and prohibition of eating, drinking, smoking, and chewing in the work area.

- Special safety hazards that may be encountered, including electrical hazards, air contaminants (CO2 wetting agents, encapsulant, and materials from Owner's operation), fire and explosion hazards, scaffold and ladder hazards, slippery surfaces, confined spaces, heat stress, and noise.

- Workshops affording both supervisory personnel and abatement workers the opportunity to see (and experience) the construction of containment barriers and decontamination facilities.

- Supervisory personnel shall, in addition, receive training or contract specifications, liability insurance and bonding, legal considerations related to abatement establishing respiratory protection medical surveillance programs, EPA, OSHA, and State record-keeping requirements.

3) Training must be provided by Montana State approved training providers and must be current, each employee having training certification renewed every 12 months as required by regulation.

4.3.3 Lead Dust Removal Training

1) Training shall be provided to all employees or agents who may be required to disturb Lead Dust, and to supervisory personnel who may be involved in planning, execution, design, or inspection of Lead Dust removal projects.

Lead Dust removal supervisors will have successfully completed the Lead in Construction Training Course and will hold current certification. Lead removal workers will have completed Four Hour Lead Awareness Training for Lead in Construction as required by WISHA and OSHA.

2) Worker training shall provide, at a minimum, information on the following topics:

- The Content Lead and Title 29 CFR 1910 and 1926.62
- The specific nature of operations which could result in exposures to lead above the action level
- Training requirements for respirators as required by 296-62 WAC, Part E and 29 CFR 1926.103
- The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant)
- The engineering controls and work practices associated with the employees job assignment including training of employees to follow relevant good work practices described in Appendix B, 29 CFR 1926
- Instructions that chelating agents should not routinely be used to remove lead from the body and should not be used at all except under the direction of a licensed physician

4.3.4 Respiratory Protection

1) Each worker involved in abatement shall be instructed in the proper use of respirators.

2) A sufficient quantity of respirator filters approved for asbestos ad lead work will be available. Respirators and unused filters, if applicable, will be stored at the job site in the changing room to protect them completely. The filters used will be high efficiency particulate air (HEPA).

3) Workers must perform a field fit test/inspection of their respirator as specified by the manufacturer.

4) No one wearing a beard shall be permitted to don a respirator and enter the work area.

5) Additional respirators and training on their donning and use must be available at the work site for authorized visitors who may request to enter the work area.

4.3.4 Other Personal Protective Equipment

1) Personal protective equipment that includes Tyvek or polypropylene coveralls with hoods, hard hats, respirators, and nitrile gloves will be provided in sufficient quantities and adequate sizes for all workers and authorized visitors.

2) Protective eyewear and hard hats shall be provided as required for workers and authorized visitors for use outside of the containment area.

4.3.5 Medical Monitoring –Asbestos Abatement

1) Medical monitoring must be provided to any employee that may be exposed to asbestos in excess of background levels during any phase of these abatement projects. The purposes of a medical monitoring program are to determine work relatedness of disease, as well as to ensure fitness for duty, particularly the ability to wear a respirator. The medical monitoring program provides the appropriate setting to share this information. Medical monitoring shall include, at a minimum, the requirements of 29 CFR 1926 and IRSE Medical Compliance Plan.

   - A work/medical history to elicit symptomatology of respiratory disease.
   - A chest x-ray (posterior-anterior, 14 x 13 in.) taken by a certified radiologist technician and evaluated by a certified B-reader.
   - A pulmonary function test, including forced vital capacity (FVC) and forced expiratory volume at one second (FEV1), and FEV1/FVC ration (administered by a NIOSH or American Thoracic Society (ATS) Certified Pulmonary Technician) and interpreted and compared to standardized normalcy by a Board Certified Pulmonary Specialist.

- Employees shall be given the opportunity to be evaluated by a physician to determine their capability to work safely while breathing through the added resistance of a respirator. Examining physicians shall be aware of the nature of respiratory protective devices and their contributions to breathing resistance. They shall also be informed of the specific types of respirators the employees shall be required to wear and the work they will be required to perform, as well as special workplace conditions, such as high temperatures, high humidity, and chemical contaminants to which employees may be exposed.

- Evaluation of groups of workers should take into consideration epidemiologic principles as suggested by the ATS in its statement on the work relatedness of disease adopted in 1982.

4.3.6 Medical Monitoring – Lead Abatement

1) Medical monitoring will be provided to any employee that may be exposed to airborne lead in excess of the action level of 30 μg^3 during any phase of the Lead dust cleaning process. The purposes of a medical monitoring program is to provide baseline blood lead levels and to provide ongoing biological monitoring to insure engineering controls are effective, as well as to ensure fitness for duty, particularly the ability to wear a respirator. The medical monitoring program provides the appropriate setting to share this information.

Medical monitoring shall include, at a minimum, the requirements of 29 CFR 1926.62

- An accurate record for each employee including Name, Social Security Number, and a description of the duties of each employee.

- A copy of the physician's written opinions, including those related to fitness for respirator use

- Results of any airborne exposure monitoring done on or for that employee and provided to the Physician

- Each employee shall be given the opportunity to be evaluated by a physician to determine their capability to work safely while breathing through the added resistance of a respirator. Examining physicians shall be aware of the nature of respiratory protective devices and their contributions to breathing resistance. They shall also be informed of the specific types of respirators the employees shall be required to wear and the work they will be required to perform

- Any employee medical complaints related to exposure to lead
- A copy medical examination results and description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information (to be retained by doctor).
- A copy of the results of biological monitoring.

4.4 Emergency Contingency Plan

1) Site personnel must be prepared to respond and act quickly in the event of an emergency. The following emergency preparedness and response procedures will aid in protecting site workers and the surrounding environment.

4.4.1 General

1) The Site Safety Officer will establish evacuation routes and assembly areas for the abatement site. All personnel entering the work area will be informed of these routes and assembly areas. Evacuation routes, rally points, and the locations of emergency equipment will be included on the site map contained within the work plan prior to the initiation of on-site activities.

2) In the case of site evacuation, the following procedures shall be observed:

- Stop working, secure equipment, and return to the decontamination area for decontamination
- Exit building
- Walk to the designated rally point using the evacuation route
- Notify the on-site IRSE Competent Person, Project Manager and the Environmental Health and Safety representative
- Remain at the rally point until further information is received

3) Personnel should not stand in roads, driveways, or in front of gates, as these locations may be used by emergency and support vehicles entering the site.

4) Each site activity will be evaluated for the potential for fire, explosion, chemical release, or other catastrophic events. Unusual events, activities, chemicals, and conditions will be immediately reported to the Competent Person.

4.4.2 Emergency Procedures

1) If an incident (personal or vehicle accident, property damage, or near miss) occurs, the following procedures will be used:

- The Competent Person will evaluate the incident, assess the need for assistance, and notify the Project Manager.
- The Competent Person will call for outside assistance as needed.
- The Competent Person will act as liaison between outside agencies and on-site personnel.

- The Competent Person will take appropriate measures to stabilize the incident scene.

- The IRSE Project Manager will provide technical guidance to the Competent Person as needed and notify the CWC's representative.

- The Competent Person will ensure that any injured employee's supervisor completes an injury report form and forwards the form to the Project Manager or Site Safety Officer.

4.4.3 Safety Signals

1) While working on site, the following hand signals will be used for communication when necessary.

Hand Signal	Meaning
Arms crossed over head	Shut off equipment
Hand gripping throat	Out of air, can't breathe
Both hands around waist	Leave area immediately
Wave hands over head	Need assistance
Thumbs up	Okay, I am all right, I understand
Thumbs down	No, negative

2) Vehicle or portable air horns will be used for alarm signals as follows:

- One long blast: Emergency evacuation of the site
- Two short blasts: Clear working area around powered or moving equipment

4.4.4 Medical Emergency

4.4.4.1 General

1) Prior to field work, Site Health and Safety Officer will contact and coordinate with all potential emergency response organizations so that they will be aware of any potential site hazards and can meet training and medical requirements. All employee injuries must be promptly reported to the Competent Person. The Competent Person will:

- Ensure that the injured employee receives prompt first aid and medical attention.

- Contact Emergency Services at 911 and state clearly *"This is a emergency at the East Helena Asarco Plant"* ever medical attention is required to ensure that appropriate services are provided.

- Complete the appropriate form or forms and submit them to the Project Manager or Site Safety Officer within one business day of an incident. Forms include:
  - Supervisor's Employee Injury Report (to be completed by the employee's supervisor)

- Vehicle Accident Report
- General Liability, Property Damage and Loss Report

- Ensure that the Project Manager and Site Safety Officer are immediately notified of the incident.

- Initiate an investigation of the incident, with the assistance of a representative prior to restarting work activities.

4.4.4.2 Chemical Inhalation

1) Any employee complaining of symptoms of chemical overexposure will be removed from the work area and transported to the designated medical facility for examination. The Competent Person must contact the Project Manager and Site Safety and Health Officer immediately.

4.4.4.3 Eye Contact

1) Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while on the site shall immediately proceed to the eyewash station. Do not decontaminate before using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Thoroughly flush the eye with clean water. Arrange prompt transport to the designated medical facility.

4.4.4.4 Skin Contact

1) Project personnel who have had skin contact with contaminants will, unless the contact is severe, precede through the decontamination facilities to the wash-up area. Personnel will remove any contaminated clothing, and then wash the affected area with water. The worker should be transported to the medical facility listed below if they show any sign of skin reddening or irritation or if they request a medical examination, MSDS should be made available to medical staff for evaluation, if available.

4.4.4.5 Personal Injury Accident

1) In the event of a personal injury accident, the Competent Person will assess the nature and seriousness of the injury. In the case of serious or life-threatening injuries, normal decontamination procedures may be abbreviated or bypassed. Less serious injuries, such as strains, sprains, minor cuts, and contusions, may only be treated after the employee has been decontaminated.

   Following decontamination, an IRSE project team member qualified in FA/CPR will administer suitable first aid. The Competent Person will then, if necessary, arrange transport to the appropriate medical facility. The Project Manager must be notified of all recordable injuries, illnesses, and vehicle accidents. Washington State Department of Labor and Industries must be verbally notified within eight hours of any accident resulting in a fatality, within 24 hours of in-patient hospitalization.

2) Because the bites of snakes, spiders, scorpions are rare, the recommended treatment is outlined here as a reminder in case of a bite. DO NOT cut the site of the bite and suck out the venom, but rather lie the victim down and keep the person calm. Try to keep the affected area lower than the heart. Ice may be applied to the area of the bite but make sure that there is no direct skin contact with the ice. Use a towel for insulation to prevent freezing the skin. DO NOT use a tourniquet or constricting band on the affected limb. Get the victim to medical attention.

4.4.4.6 Fire

1) In the case of a fire on the site, the Competent Person will assess the situation and determine the proper response. All personnel NOT trained in the use of fire extinguishers shall evacuate the area involved. Only IRSE personnel trained in the use of extinguishers may attempt to extinguish the fire with available extinguishers if it is safe to do so. If these trained employees do not wish to make the attempt, they are to evacuate also. In the event of ANY fire, IRSE will call the East Helena Fire Department at the number listed in the Site Specific Safety Plan and notify the Site Safety and Health Officer immediately. Fire fighting is a job for the fire department. No property or equipment is so important as to risk an employee's life.

4.5 Failure of Work Area Containment System (where applicable)

1) The work enclosure and negative air system will be closely monitored for failure or a breach. If such an event occurs, the work inside would immediately stop and the problem resolved. A breach in containment could be quickly repaired with duct tape; if the negative air system is the source of problems, the cause of the malfunction will be determined, and the necessary repairs or replacements made so that work can resume.

2) Asbestos waste that can be vacuumed will be contained in a HEPA vacuum. The bagged waste from the operation would not create a spill hazard. The asbestos waste inside the HEPA vacuum will be removed inside a containment area built specifically for this purpose.

4.6 Emergency Information

1) Before the start of the project, contact will be made with local authorities and emergency services to establish a communication channel during an event of emergency and to familiarize the project personnel with the communication procedures and services. Pertinent emergency information will be included on the daily tailgate safety meeting forms.

2) The Site Specific Safety Plan at Appendix E contains directions to St Peter's Hospital (see also Emergency Phone List attached).

4.6.1 Key Project Personnel

IRSE Project Manager	Carl Burnham	509-927-7867 509-998-8257	office mobile
IRSE Competent Person	Mark Kazemba	509-884-4267	mobile
IRSE Health and Safety Officer	Robert Reed	509-927-7867	
CWC Project Manager	_____	_____ _____	office mobile
CWC Safety and Health Officer	_____	_____ _____	office mobile
Asarco Acting Plant Manager	Blaine Cox	406-227-7100	office
Asarco Environmental Manager	Jon Nickel	406-227-7100	office
Department of Environmental Quality		406-444-5300	office
OSHA Regional Office		406-247-7494	office (Billings)
Montana DEQ (NEHEPS)	John Podolinski	406-444-2690 406-444-1499	office fax
Occupational Medicine Associates	Dr. Royce Van Gerpin	509-455-5555	office

4.6.2 Medical Care Facilities

Saint Peter's Hospital
2475 Broadway
Helena, MT 59601
(253) 512-2708

4.6.3 Emergency Telephone Numbers

Emergency	**911** Notify Emergency Crews: Say *"This is an emergency at the E Helena Asarco lead smelter"*
National Response Center (spills)	800 - 424-8802
Regional Poison Control Center	800 - 525-5042
Fire Department	406-447-5477 or 911
Police Department	406-442-3233 or 911

5.0 Asbestos and Lead Removal Techniques and Procedures

1) Asbestos-containing materials that will be removed from the site buildings and are judged by a competent person to be friable (i.e., those ACMs that, when dry, can be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

1) Lead Dust is present within the interiors of structures schedule to be demolished. Theses structure will be cleaned of the dust before demolition of the structure.

2) Lead Dust waste that is collected during cleaning of the structures will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

5.1 Notifications

1) IRSE will make required notifications to the Department of Environmental Quality and submit these notifications to CWC before beginning work.

5.2 Work Area Preparation

5.2.1 Warning Signs – Asbestos Abatement

2) Danger signs meeting the specifications of OSHA Construction Safety Order, Section 1529 and WAC 296-62-077 will be posted at any location and approach where regulated areas are present. Signs will be posted at a distance sufficiently far enough away from the work areas to permit any employee or visitor to read the sign and take the necessary protective measures to avoid exposure. Warning signs shall include the following wording:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2) These warning signs shall be printed in letters of sufficient size to be clearly legible.

5.2.2 Warning Signs- Lead Dust Abatement

3) Entrance by non- trained personnel into the lead paint removal area will be restricted using 3" barrier tape posted at the work area perimeter. Warning tape shall include the following wording:

Danger Lead Removal
Authorized Personnel Only

2) The warning tape shall be printed with letters of sufficient size to be clearly legible.

5.2.3 Electrical Power

1) The contractor will provide adequate power at each of the buildings. IRSE will provide temporary lighting sources and ensure safe installations (including ground faulting) of temporary power sources and equipment by complying with all applicable electrical code requirements and OSHA requirements for temporary electrical systems, within each building, as applies.

5.2.4 Establishing Asbestos Removal Work Areas

1) During indoor Class I removal of thermal system insulation, the wrap and cut method will be utilized. (HEPA) vacuums and wet methods will be utilized.

2) As applicable, IRSE will seal the exterior of the regulated areas. All windows, doors, and any other openings to the outside of the building from the regulated areas, will be sealed with a minimum of one layer of 6-mil poly sheeting with duct tape, until a negative exposure assessment is conducted.

3) During Class I removal of TSI using glovebag and wrap and cut methods with HEPA vacuum method procedures, the work area will be restricted using signs as described in 5.2.1. 6-mil poly will be installed on floors/ground in work area. Negative air machines may be installed in order to provide clean air from outside the work area at sufficient quantities and at strategic locations, so as to provide clean air in the workers' breathing zone, as described in Appendix D IRSE Hazardous Material Contractor Quality Control Plan.

4) During outdoor Class II removal of transite shingles and skirting, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

5) During outdoor Class II removal of metal siding, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

6) During Class II removal of floor covering, the work area will be restricted using signs as described in 5.2.1. 6-mil poly will be installed critical in the work area. Negative air machines will be installed in order to provide clean air from outside the work area at sufficient quantities and at strategic locations, so as to provide clean air in the workers' breathing zone, as described in Appendix D IRSE Hazardous Material Contractor Quality Control Plan.

7) During Class II removal of asbestos-containing roofing materials a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 10-20' out from the base of the building.

8) During Class II removal of window caulking, a single layer of 6-mil poly will be placed on the ground directly under the material to be removed, extending 5-10' out from the base of the building.

8) During removal of all Class II work, the area will be restricted using signs described in 5.2.1. Specific means and methods will be found in Appendix D.

6) 2" red "DANGER ASBESTOS - DO NOT ENTER" tape will be used to restrict access by untrained personnel.

5.2.5 Establishing Lead Dust Removal Work Areas

1) As applicable, IRSE will seal the exterior of the regulated areas. All windows, doors, and any other openings to the outside of the building from the regulated areas, will be sealed with a minimum of one layer of 6-mil poly sheeting with duct tape, until a negative exposure assessment is conducted.

2) 2" red "DANGER LEAD - DO NOT ENTER" tape will be used to restrict access by untrained personnel.

5.3 Workplace Entry and Exit Procedures – Asbestos and LEAD

1) IRSE will be using mobile trailer designed as a 3-stage worker decontamination unit, and a fixed worker decontamination unit (2- or 3-stage, depending on the scope of work at each individual work site) and locate it next to the entrance of the work area.

2) If the quantity of thermal system insulation exceeds 10 linear feet or 25 square feet, IRSE will construct a three-stage decontamination unit, including clean room, shower and dirty room, contiguous to the "regulated work area". If the quantity of ACM to be abated is less than 10 linear feet or 25 square feet, IRSE will construct a two-stage decontamination unit, including clean room and dirty room, contiguous to the "regulated work area". The procedures that will be used to enter decontamination units are described below.

3) Workers will enter the regulated work areas through the worker decontamination unit. The decontamination unit is a fully enclosed system.

4) These decontamination units will include an equipment or "dirty" room, a functional shower equipped with hot and cold running water (if necessary), and a changing or "clean" room in series. The decontamination units will also be constructed in such a manner as to provide a systematic reduction of contamination for the workers and equipment exiting the regulated work area. Personnel entry into and egress from the regulated work areas will be through the decontamination units. Equipment and material replenishment may also be conducted through the decontamination unit.

5) Wastewater resulting from the operation of the shower units shall be filtered with a 5-micron pore-size filtration system before reuse or discharge. To the extent feasible, filtered wastewater will be reclaimed and used on site for application in wet method work practices. Wastewater to be discharged shall be sufficiently filtered to meet state and local water quality objectives before discharge. Filters shall be changed as necessary to achieve this objective.

6) Before exiting the work area, personnel shall remove outer protective clothing and use a HEPA vacuum to remove ACM debris from protective clothing. Workers shall then proceed to move disposable clothing and dispose of it as hazardous waste. Non-disposable clothing (such as work boots) shall be decontaminated before being removed from the work area.

**Removing asbestos dust from protective clothing or equipment by blowing, shaking, or any other means that disperses asbestos fibers into the air shall likewise be prohibited.

6) If applicable, workers exiting the regulated work areas will wash (shower) all areas of the body that were potentially exposed to asbestos contamination.
Respirators shall continue to be worn by workers until the worker has entered the shower and begun to wash. Once the head has been deluged with water, the respirator may be removed. IRSE will supply workers with soap and shampoo to use in the showers.

7) A secure change room shall be provided outside the decontamination units and shall be equipped with storage for workers' street clothes and personal belongings. Workers are to change from street clothes each day before entering the regulated work area. Workers are to change back into street clothes each day before leaving the work site. Personnel are prohibited from wearing potentially contaminated clothing off the site. Housekeeping within the change room will be maintained by IRSE. Periodic area air monitoring will be conducted to evaluate housekeeping efforts.

8) Waste containers shall also be decontaminated using HEPA vacuums and by wet wiping before being removed from the work areas.

9) In the event an emergency egress from within the regulated work is required, the above-described personnel decontamination procedures will not be required. IRSE will exercise judgment to ensure that worker health and safety is placed above environmental contamination concerns.

10) In those instances when it is not feasible to provide shower facilities contiguous with the work area or where the work is performed outdoors, the Contractor shall ensure that employees remove (1) asbestos contamination from their worksuits in the equipment room utilizing a HEPA vacuum before proceeding to a shower that is not adjacent to the work area, or (2) their contaminated worksuits in the equipment room, don a clean worksuit, and proceed to a shower that is not adjacent to the work area. A second inner disposable/breathable Tyvek whole-body coverall may be utilized by workers for modesty's sake under the primary outer worksuit. The outer suit will be cleaned using a HEPA vacuum and removed within the isolated work area.

11) The containment design and decontamination unit that will be utilized for each work area will be dependent on the DEQ asbestos work classification.

5.4 Personal Protective Equipment

1) Except when more stringent requirements are set forth, the personal protective equipment (PPE) utilized during the conduct of this work must meet or exceed the requirements contained in Title 29 CFR 1926.1101.

5.4.1 Respiratory Protection

1) Half-face negative pressure respirators (equipped with HEPA filters) will be utilized for Class I and II materials being removed on this project. Protective glasses or goggles worn by workers will conform to the specifications of the ANSI Z87.1 standard of Title 29 CFR §1910.133.

2) Half-face negative pressure respirators (equipped with HEPA filters) will be worn by all personnel working within Lead Dust Removal Work Areas.

3) Once a negative pressure enclosure (if applies) has been visually inspected and placed under a negative air pressure differential, full-faced supplied air respirators operated in constant flow or pressure demand mode and equipped with HEPA escape filters, will be worn by workers, supervisors, work monitors, industrial hygienists, and other entering the regulated work area.

3) During outdoor Class II removal of materials, half-face negative pressure respirators equipped with HEPA filters will be used.

4) During indoor Class II removal of all materials identified, half-face negative pressure respirators equipped with HEPA filters will be used.

5) All respirators shall be used in a manner consistent with state-of-the-industry practices. The respirators shall be worn with head straps in direct contact with the head and shall not be worn on the outside of the hoods of disposable whole-body coveralls. An exception to this is allowable in those instances when a remote decontamination unit is being utilized and the worker is double suited. Respirators shall be worn until proper personal decontamination methods, as described herein, are completed.

6) The Contractor will provide respirators in accordance OSHA 1019.133 Respirator Protection

5.4.2 Whole Body Protection

1) Work boots with nonskid soles or impermeable work-boot covers shall be worn by workers. Protective footwear worn by workers shall conform to the specifications of the ASNI Z41.1 standard. Work boots that have come into contact with contaminated material shall be cleaned, decontaminated, and bagged before removal from the work area.

2) Protective head gear (hard hats) shall be worn at all times that work is in progress. Protective head gear worn by workers shall conform to the specifications of the ANSI Z89.1 (Class A) standard. Hard hats shall be thoroughly decontaminated before removing from the work area.

3) In work areas where excessive noise is prevalent, worker shall wear hearing protection sufficient to ensure that the worker's 8-hour time-weighted average (TWA) exposure does not exceed 85 Dba.

4) IRSE will make available extra sets of PPE to be used by the owners authorized representative for use to enter the regulated work areas.

5.5 Asbestos Removal Techniques and Procedures

1) For the purposes of this work plan, the removal of ACM thermal system insulation (TSI) or ACM surfacing materials will be considered "Class I Asbestos Work," as defined by OSHA Title 29 CFR 1926.1101 and shall be conducted in accordance with work practices and requirements set forth for Class I work.

2) IRSE will conduct the construction activities described herein in accordance with all currently applicable federal, state, and local laws and regulations including, but not limited to, Title 29 CFR 1926.1101.

3) All asbestos-containing material thermal system insulation will be removed via the glovebag method or glovebag and wrap and cut method, with negative air ventilation procedures.

5.5.1 Removal of ACM Thermal System Insulation from Buildings

5) IRSE will then pre-clean the work area. This will entail cleaning of any visible asbestos debris and dirt which may affect area and clearance air monitoring. Following pre-cleaning, IRSE will begin installing glovebags on the pipes which have been determined to contain asbestos-containing thermal system insulation.

6) The IRSE Competent Person will then conduct visual inspections and smoke testing on the glovebags and ensure that all necessary tools are present, including Hudson sprayers, waste bags, and a HEPA vacuum.

7) Only after satisfactory visual inspections from the IRSE Competent Person will the go ahead to begin asbestos removal be given.

8) All glovebagging will be conducted in two-man crews. One worker will remove the asbestos-containing pipe insulation inside the glovebag while the other worker constantly mists the insulation with amended water.

9) Once the ACM insulation has been removed from the pipe and is on the bottom of the glovebag, the pipe and top inside portion of the glovebag will be wet wiped clean. IRSE will twist the bag several times and tape it to keep the ACM in the bottom during removal of the glovebag from the pipe. A HEPA vacuum should be used to evacuate air out of the glovebag.

10) A 6-mil disposal bag will be slipped over the glovebag (while still attached to the pipe). The tape holding glovebag to pipe will then be removed and the top of glovebag opened then folded down into waste bag.

11) Following an acceptable visual inspection from the CWC Site Safety Officer, IRSE will apply an encapsulant to all surfaces in the work area and clearance sampling can be collected for analysis.

5.5.2 Outdoor Removal of Transite Shingles and Metal Siding

1) The workers will don appropriate PPE as described in Section 5.4.

2) IRSE will perform setup of the work area as described in Section 5.2.3(3).

3) IRSE will notify the on-site Safety Officer prior to beginning removal so that visual inspections can be conducted to insure that all necessary tools are available, including water, HEPA vacuum, lined dumpster.

4) After satisfactory visual inspection by the Safety Officer, IRSE will begin transite removal.

5) Transite removal will be conducted using methods described in the IRSE Hazardous Material Contractor Quality Control Plan.

5.5.3 Removal of all other Class II Materials

1) The workers will don appropriate PPE as described in Section 5.4.

2) IRSE will perform setup of the work area as described in Section 5.2.3(7).

3) IRSE will notify the on-site Safety Officer prior to beginning removal so that visual inspections can be conducted to insure that all necessary tools are available, including water, HEPA vacuum, lined dumpster.

4) After satisfactory visual inspection by the Safety Officer, IRSE will begin removal of specific materials, as identified in Appendix D.

5) Class II removal will be conducted using methods described in the IRSE Hazardous Material Contractor Quality Control Plan.

5.5.4 Final Visual Inspection of Work Area

1) Following an acceptable visual inspection by the CWC Site Safety Officer after asbestos removal from each asbestos removal work area, IRSE will apply an encapsulant to all surfaces in the work area and clearance sampling can be collected for analysis.

2) All abated areas will be inspected by the Contractor, CWC Onsite Supervisor and IRSE supervisor. Upon successful inspection, each will sign the completed form *"Final Inspection Report"* Form. The Form can be found at the end of Attachment C: Forms.

5.6 Removal of Lead Dust from Buildings

1) IRSE will conduct the construction activities described herein in accordance with all currently applicable federal, state, and local laws and regulations including, but not limited to, Title 29 CFR 1019.10025.

5.6.1 Vacuuming Lead dust in Building

1) The workers will don appropriate PPE a stated in Section 5.4 and IRSE Hazardous Material Quality Control Plan.

2) IRSE will then perform setup of the "Lead Removal Work Area" as stated in Section 5.2.4. (1), including installing critical barriers.

3) IRSE will also install a two stage decontamination unit as stated in Section 5.3. The decontamination unit will be placed at the doorway leading into the building or at a central area on site.

4) Once the decontamination unit and all critical seals have been installed, the IRSE Competent Person will perform a visual inspection of the work area to ensure that all critical seals are in place and that adequate negative pressure has been established, if applies.

4) All abated areas will be inspected by the Contractor, CWC Onsite Supervisor and IRSE supervisor. Upon successful inspection, each will sign the completed form *"Final Inspection Report"* Form. The Form can be found at the end of Attachment C: Forms.

6.0 Waste Handling and Disposal

6.1 Packaging and Storage of Waste and Removal from the Work Area

1) The friable ACMs that will be removed from the project site and are judged by a competent person to be friable (i.e., those ACMs that, when dry, can be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

2) Friable asbestos waste shall be placed in two layers of 6-mil polyethylene disposal bags.

3) All friable asbestos waste (bagged) will exit the work area through the equipment room of the decontamination unit or from a separate waste load out decontamination unit. These waste loads out units will be contiguous to the work area containment.

4) The personnel loading the asbestos-containing waste will be protected by disposable clothing and, at a minimum, half-facepiece air-purifying dual-cartridge respirators equipped with high efficiency filters.

5) The bagged or wrapped asbestos waste shall be properly labeled and placed in locked storage containers. At a minimum, the outside of each waste bag or package containing asbestos hazardous waste will be labeled as described in 6.2(5).

6.2 Packaging and Storage of Nonfriable Waste and Removal from the Work Area

1) The nonfriable ACMs that will be removed from the project site and are judged by a competent person to be nonfriable (i.e., those ACMs that, when dry, cannot be crushed, crumbled, pulverized, or otherwise rendered to a dust by hand pressure) will be packaged and stored in a manner prescribed herein for disposal as hazardous waste.

2) Nonfriable asbestos waste will be loaded directly into a mega boxes, (Gaylord boxes) place in disposal bags and doubled bagged or double wrapped with 6 mil poly.

3) The personnel loading the asbestos-containing waste will be protected by disposable clothing and, at a minimum, half-facepiece air-purifying dual-cartridge respirators equipped with high efficiency filters.

5) The wrapped asbestos waste shall be properly labeled and placed in locked storage containers. At a minimum, the outside of each package containing asbestos hazardous waste will be labeled as follows:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
HAZARDOUS WASTE
STATE AND FEDERAL LAW
PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY
AUTHORITY OF THE WASHINGTON DEPARTMENT OF
TOXIC SUBSTANCES CONTROL
Generator's Name_____
Address _____
Manifest _____
RQ, Asbestos, 9, NA2212, III

6) The asbestos disposal containers (e.g., bags, wraps and boxes) and storage areas shall be secured and placarded with appropriate warning signage

6.3 Transportation and Disposal

1) The disposal of waste that contains asbestos waste and lead waste will stay onsite and be placed in a storage area designated by the General Contractor.

7.0 Air Monitoring Sampling

7.1 Personal Air Monitoring – Asbestos

1) IRSE's Competent Person will be conducting personal air monitoring on workers involved in the project. Personal air monitoring for asbestos will be conducted in accordance with Title 29 CFR 1926.1101. The IRSE Competent Person shall use the personal air monitoring results to evaluate the effectiveness of engineering controls and the adequacy of PPE and to determine whether the appropriate work practices are being utilized.

2) Personal exposure monitoring for asbestos shall be conducted utilizing single-use standard 25-mm-diameter, 0.8 -micron pore size, MCE membrane filters and cassettes with nonconductive cowlings ("barrels") and shrink bands. Air samples for asbestos concentrations will be analyzed by PCM Method 7400/7402.

3) The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 fiber per cubic centimeter (f/cc) as averaged over a sampling period of 30 minutes nor in excess of 0.1f/cc as expressed as an 8-hour TWA.

4) The Contractor will post the results of daily personal air monitoring at the job site.

7.2 Pre-abatement, Area and Perimeter Sampling – Asbestos

1) Except as otherwise noted, environmental sampling for airborne asbestos shall be conducted utilizing single-use, standard 25-millimeter-diameter, 0.8-micron pore size, mixed MCE membrane filters and cassettes with nonconductive cowlings ("barrels") and shrink bands. Air samples for asbestos concentrations will be analyzed by PM Method 7400.

2) IRSE Competent Person shall conduct daily environmental air sampling for airborne fiber concentrations outside the regulated asbestos work areas. A minimum of two samples will be collected outside each Class I negative pressure enclosure abatement activities.

3) Pre-abatement (baseline or background) air sampling will also be conducted by IRSE's supervisor. These samples will be collected in general accordance with 29 CFR 1926.1101, although the number of samples collected per location will vary. Air samples for baseline asbestos fiber concentrations will be analyzed by PCM Method 7400. Pre-abatement air samples will be collected by "nonaggressive" methods.

7.3 Final Cleaning, Clearance Sampling Methodology and Analysis – Asbestos

1) Visual inspections and air clearance sampling of each work area shall be conducted by an independent contractor hired by the owner/general contractor. Following the completion of asbestos abatement and final detail cleaning in each work area. The cleaning phase will include misting the air with amended water to reduce airborne fiber concentrations. The cleaning process shall also include vacuuming with HEPA-equipped vacuums and wet wiping. Horizontal surfaces within the area shall be cleaned of all visible asbestos debris using a HEPA vacuum and wet wiped.

If a visual inspection reveals residual three-dimensional debris, IRSE will abate the debris, detail clean the area of the debris, and repeat the HEPA vacuum and wet wiping process. Once the recleaning process is complete, the work area shall be subject to another visual inspection for the presence of residual three-dimensional debris.

2) Satisfactory completion of this visual inspection will be followed by the encapsulation of the substrates and/or systems from which the ACM was removed. Following a suitable period of time to allow the encapsulant to dry, final air clearance samples will be collected. Clearance air samples will be collected using the methods described herein. Negative pressure equipment (NPE), if applicable, will continue in operation until satisfactory clearance air sample results are achieved. Failure to achieve satisfactory air clearance results will result in IRSE repeating the final cleaning process and the subsequent collection of additional clearance air samples.

3) Collection and analysis of clearance air sample monitoring for asbestos hazard abatement will be an independent industrial hygiene provider under contract with the owner/general contractor. Collection and analysis of clearance work areas after the ACM hazard has been abated and the work area has passed a visual clearance

4) Five or more samples will be collected within each containment. Clearance air samples indicating airborne fiber concentrations within the requirements of AHERA Guidelines for asbestos response action activities in schools will received, and written permission from Northern Industrial Hygiene will be obtained before releasing IRSE to demobilize the work area.

5) Once a work area has been abated of ACM hazards, satisfactory final air clearance testing has been concluded and written permission from Northern Industrial Hygiene has been obtained, any remaining layers of polyethylene sheeting shall be removed and disposed of as asbestos waste

7.4 Personnel Air Monitoring – Lead

1) IRSE's Competent Person Supervisor will be conducting personal air monitoring on workers involved in the project. Personal air monitoring for lead will be conducted in accordance with Title 29 CFR 1926.62. The IRSE Supervisor shall use the personal air monitoring results to evaluate the effectiveness of engineering controls and the adequacy of PPE and to determine whether the appropriate work practices are being utilized.2) Personal exposure monitoring for lead shall be conducted utilizing single-use standard 37-mm-diameter, 0.8 -micron pore size, MCEF membrane filters and cassettes with nonconductive cowlings ("barrels").

3) The Contractor's workers shall not be exposed to airborne lead in concentrations over 15*ug*/m^3 (half of the action level) as expressed as an 8-hour TWA. If airborne concentrations of lead in the breathing zone of any individual employee reaches 10*ug*/m^3, work will stop and the Northern Management Services Project Manager will be notified. Engineering controls will be re-evaluated and additional engineering controls will be implemented before work resumes.

4) The Contractor will post the results of daily personal air monitoring at the job site within 72 hours of air sample collection.

7.5 Area and Perimeter Sampling - Lead

1) The IRSE Supervisor shall use the personal air monitoring results to evaluate the effectiveness of engineering controls and the adequacy of PPE and to determine whether the appropriate work practices are being utilized.

2) Monitoring for lead shall be conducted utilizing single-use standard 37-mm-diameter, 0.8 -micron pore size, MCEF membrane filters and cassettes with nonconductive cowlings ("barrels").

4) IRSE's Supervisor will collect air samples prior (baseline or background) to LBP removal. These samples will be collected for information and documentation only, and are not required by contract documents or regulation.

8.0 Laboratory Analysis of Personal Air Samples

1) All personal and OWA air samples will be analyzed at Mountain Labs, Inc.. This lab is an American Industrial Hygiene Association (AIHA) and an EPA National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

2) All air samples for asbestos concentration will be analyzed by PCM Method 7400/7402.

APPENDIX B

FUMED SLAG ANALYTICAL DATA

May 02, 2005

Iver Johnson
MT DEQ
PO Box 200901
Helena, MT 59620

COPY

Workorder No.: H05040130

Project Name: ASARCO Slag Pile

Energy Laboratories Inc received the following 10 samples from MT DEQ on 4/14/2005 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H05040130-001	ASP01-B3	04/14/05 14:15	04/14/05	Solid	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Digestion, Total Metals Digestion, Mercury by CVAA
H05040130-002	ASP02-B5	04/14/05 14:21	04/14/05	Solid	Same As Above
H05040130-003	ASP03-B14	04/14/05 14:28	04/14/05	Solid	Metals by ICP/ICPMS, Total Chloride, Sulfate Mercury in Solid By CVAA Moisture Moisture Polychlorinated Biphenyls (PCB's) pH Digestion, Total Metals Digestion, Mercury by CVAA Saturated Paste Extraction Sonication Extraction Soil Sonication Extraction Semi-Volatile Organic Compounds, PAHs Volatile Organics, Methanol Extraction 8260-Volatile Organic Compounds - Short List
H05040130-004	ASP04-C4	04/14/05 14:37	04/14/05	Solid	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Digestion, Total Metals Digestion, Mercury by CVAA
H05040130-005	ASP05-C9	04/14/05 14:44	04/14/05	Solid	Metals by ICP/ICPMS, Total Chloride, Sulfate Mercury in Solid By CVAA Moisture Moisture Polychlorinated Biphenyls (PCB's) pH Digestion, Total Metals Digestion, Mercury by CVAA Saturated Paste Extraction Sonication Extraction Soil Sonication Extraction Semi-Volatile Organic Compounds, PAHs Volatile Organics, Methanol Extraction 8260-Volatile Organic Compounds - Short List

H05040130-006	ASP06-D16	04/14/05 14:50 04/14/05	Solid	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Digestion, Total Metals Digestion, Mercury by CVAA
H05040130-007	ASP07-F3	04/14/05 14:57 04/14/05	Solid	Same As Above
H05040130-008	ASP08-G2	04/14/05 15:04 04/14/05	Solid	Metals by ICP/ICPMS, Total Chloride, Sulfate Mercury in Solid By CVAA Moisture Moisture Polychlorinated Biphenyls (PCB's) pH Digestion, Total Metals Digestion, Mercury by CVAA Saturated Paste Extraction Sonication Extraction Soil Sonication Extraction Semi-Volatile Organic Compounds, PAHs Volatile Organics, Methanol Extraction 8260-Volatile Organic Compounds - Short List
H05040130-009	ASP09-G4	04/14/05 15:07 04/14/05	Solid	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Digestion, Total Metals Digestion, Mercury by CVAA
H05040130-010	ASP10-H16	04/14/05 15:15 04/14/05	Solid	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By: Deborah C. Grimm

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-001
Client Sample ID: ASP01-B3

Report Date: 05/02/05
Collection Date: 04/14/05 14:15
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	34.9	mg/kg		5.0		SW6020	04/27/05 00:49 / rlh
Arsenic	130	mg/kg		5.0		SW6020	04/27/05 00:49 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 03:48 / jjw
Cadmium	3.1	mg/kg		1.0		SW6010B	04/20/05 19:24 / jjw
Chromium	60.8	mg/kg		5.0		SW6010B	04/20/05 19:24 / jjw
Cobalt	164	mg/kg		5.0		SW6010B	04/20/05 19:24 / jjw
Iron	196000	mg/kg	D	40		SW6010B	04/20/05 19:28 / jjw
Lead	134	mg/kg		5.0		SW6010B	04/20/05 19:28 / jjw
Manganese	11400	mg/kg		5.0		SW6010B	04/22/05 03:48 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 13:51 / KC
Nickel	8.4	mg/kg		5.0		SW6010B	04/20/05 19:24 / jjw
Phosphorus	652	mg/kg		10		SW6010B	04/22/05 03:48 / jjw
Selenium	6.4	mg/kg		5.0		SW6020	04/27/05 00:49 / rlh
Zinc	13200	mg/kg		5.0		SW6010B	04/20/05 19:28 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-002
Client Sample ID: ASP02-B5

Report Date: 05/02/05
Collection Date: 04/14/05 14:21
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	46.7	mg/kg		5.0		SW6020	04/27/05 00:56 / rlh
Arsenic	135	mg/kg		5.0		SW6020	04/27/05 00:56 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 03:51 / jjw
Cadmium	4.1	mg/kg		1.0		SW6010B	04/20/05 19:32 / jjw
Chromium	59.4	mg/kg		5.0		SW6010B	04/20/05 19:32 / jjw
Cobalt	207	mg/kg		5.0		SW6010B	04/20/05 19:32 / jjw
Iron	243000	mg/kg	D	80		SW6010B	04/22/05 03:51 / jjw
Lead	140	mg/kg		5.0		SW6010B	04/20/05 19:32 / jjw
Manganese	11700	mg/kg		5.0		SW6010B	04/22/05 03:51 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 13:57 / KC
Nickel	20.4	mg/kg		5.0		SW6020	04/27/05 00:56 / rlh
Phosphorus	584	mg/kg		10		SW6010B	04/22/05 03:51 / jjw
Selenium	8.5	mg/kg		5.0		SW6020	04/27/05 00:56 / rlh
Zinc	16900	mg/kg		5.0		SW6010B	04/22/05 03:51 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-003
Client Sample ID: ASP03-B14

Report Date: 05/02/05
Collection Date: 04/14/05 14:28
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / I
PHYSICAL CHARACTERISTICS							
Moisture	0.500	wt%		0.0100		SW3550A	04/22/05 08:15 / M
CHEMICAL CHARACTERISTICS							
pH, 1:2	8.6	s.u.		0.1		ASA10-3	04/25/05 16:18 / sr
Chloride, 1:2	1.99	mg/kg		1.00		ASA10-3	04/26/05 11:49 / qc
METALS, TOTAL							
Antimony	33.7	mg/kg		5.0		SW6020	04/27/05 01:03 / rlh
Arsenic	118	mg/kg		5.0		SW6020	04/27/05 01:03 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:02 / jjw
Cadmium	2.6	mg/kg		1.0		SW6010B	04/20/05 19:35 / jjw
Chromium	67.1	mg/kg		5.0		SW6010B	04/20/05 19:35 / jjw
Cobalt	117	mg/kg		5.0		SW6010B	04/20/05 19:35 / jjw
Iron	264000	mg/kg	D	80		SW6010B	04/22/05 04:02 / jjw
Lead	63.8	mg/kg		5.0		SW6010B	04/20/05 19:35 / jjw
Manganese	13200	mg/kg		5.0		SW6010B	04/22/05 04:02 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 13:59 / KC
Nickel	14.5	mg/kg		5.0		SW6020	04/27/05 01:03 / rlh
Phosphorus	612	mg/kg		10		SW6010B	04/22/05 04:02 / jjw
Selenium	8.4	mg/kg		5.0		SW6020	04/27/05 01:03 / rlh
Zinc	13500	mg/kg		5.0		SW6010B	04/22/05 04:02 / jjw
VOLATILE ORGANIC COMPOUNDS							
Bromoform	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Benzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Bromobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Bromochloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Bromodichloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Bromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Carbon tetrachloride	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Chlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Chloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
2-Chloroethyl vinyl ether	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Chloroform	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Chloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
2-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
4-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Chlorodibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,2-Dibromoethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Dibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,2-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-003
Client Sample ID: ASP03-B14

Report Date: 05/02/05
Collection Date: 04/14/05 14:28
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
1,3-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,4-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Dichlorodifluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,2-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
cis-1,2-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
trans-1,2-Dichlorpethene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,3-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
2,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
cis-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
trans-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Ethylbenzene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Methyl tert-butyl ether (MTBE)	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Methylene chloride	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Methyl ethyl ketone	ND	mg/kg		4.0		SW8260B	04/21/05 16:42 / trr
Styrene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1,1,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1,2,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Tetrachloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Toluene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1,1-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,1,2-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Trichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Trichlorofluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
1,2,3-Trichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Vinyl chloride	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
m+p-Xylenes	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
o-Xylene	ND	mg/kg		0.20		SW8260B	04/21/05 16:42 / trr
Surr: p-Bromofluorobenzene	134	%REC			78-160	SW8260B	04/21/05 16:42 / trr
Surr: Dibromofluoromethane	116	%REC			70-132	SW8260B	04/21/05 16:42 / trr
Surr: 1,2-Dichloroethane-d4	114	%REC			60-136	SW8260B	04/21/05 16:42 / trr
Surr: Toluene-d8	120	%REC			75-138	SW8260B	04/21/05 16:42 / trr
SEMI-VOLATILE ORGANIC COMPOUNDS							
Acenaphthene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sm
Acenaphthylene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sm
Anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sm
Benzo(a)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sm

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MCL - Maximum contaminant level. ND - Not detected at the reporting limit

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-003
Client Sample ID: ASP03-B14

Report Date: 05/02/05
Collection Date: 04/14/05 14:28
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / I
SEMI-VOLATILE ORGANIC COMPOUNDS							
Benzo(a)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Benzo(b)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Benzo(g,h,i)perylene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Benzo(k)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Chrysene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Dibenzo(a,h)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Fluorene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Indeno(1,2,3-cd)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Naphthalene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Phenanthrene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 13:56 / sı
Surr: 2-Fluorobiphenyl	82.5	%REC			30-115	SW8270C	04/21/05 13:56 / sı
Surr: Nitrobenzene-d5	83.7	%REC			23-120	SW8270C	04/21/05 13:56 / sı
Surr: Terphenyl-d14	98.6	%REC			18-137	SW8270C	04/21/05 13:56 / sı
POLYCHLORINATED BIPHENYLS (PCB'S)							
Aroclor 1016	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1221	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1232	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1242	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1248	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1254	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1260	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1262	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Aroclor 1268	ND	mg/kg		0.017		SW8082	04/24/05 03:13 / la
Surr: Decachlorobiphenyl	96.0	%REC			50-126	SW8082	04/24/05 03:13 / la
Surr: Tetrachloro-m-xylene	86.0	%REC			42-115	SW8082	04/24/05 03:13 / la

Sample extract received a Sulfuric Acid Clean-up (EPA Method 3665) and a Sulfur Clean-up (EPA Method 3660) prior to analysis

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ.
Project: ASARCO Slag Pile
Lab ID: H05040130-004
Client Sample ID: ASP04-C4

Report Date: 05/02/05
Collection Date: 04/14/05 14:37
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / I
METALS, TOTAL							
Antimony	43.5	mg/kg		5.0		SW6020	04/27/05 01:10 / rlt
Arsenic	155	mg/kg		5.0		SW6020	04/27/05 01:10 / rlt
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:06 / jjw
Cadmium	5.1	mg/kg		1.0		SW6010B	04/20/05 19:39 / jjw
Chromium	71.2	mg/kg		5.0		SW6010B	04/20/05 19:39 / jjw
Cobalt	212	mg/kg		5.0		SW6010B	04/20/05 19:39 / jjw
Iron	273000	mg/kg	D	80		SW6010B	04/22/05 04:06 / jjw
Lead	364	mg/kg		5.0		SW6010B	04/20/05 19:39 / jjw
Manganese	12200	mg/kg		5.0		SW6010B	04/22/05 04:06 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:01 / KC
Nickel	22.9	mg/kg		5.0		SW6020	04/27/05 01:10 / rlh
Phosphorus	586	mg/kg		10		SW6010B	04/22/05 04:06 / jjw
Selenium	12.1	mg/kg		5.0		SW6020	04/27/05 01:10 / rlh
Zinc	17900	mg/kg		5.0		SW6010B	04/22/05 04:06 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-005
Client Sample ID: ASP05-C9

Report Date: 05/02/05
Collection Date: 04/14/05 14:44
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Moisture	0.800	wt%		0.0100		SW3550A	04/22/05 08:15 / MC
CHEMICAL CHARACTERISTICS							
pH, 1:2	9.0	s.u.		0.1		ASA10-3	04/25/05 16:18 / srm
Chloride, 1:2	2.89	mg/kg		1.00		ASA10-3	04/26/05 12:13 / qed
METALS, TOTAL							
Antimony	37.1	mg/kg		5.0		SW6020	04/27/05 01:44 / rlh
Arsenic	117	mg/kg		5.0		SW6020	04/27/05 01:44 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:13 / jjw
Cadmium	3.1	mg/kg		1.0		SW6010B	04/20/05 19:42 / jjw
Chromium	74.4	mg/kg		5.0		SW6010B	04/20/05 19:42 / jjw
Cobalt	153	mg/kg		5.0		SW6010B	04/20/05 19:42 / jjw
Iron	282000	mg/kg	D	80		SW6010B	04/22/05 04:13 / jjw
Lead	160	mg/kg		5.0		SW6010B	04/20/05 19:42 / jjw
Manganese	11800	mg/kg		5.0		SW6010B	04/22/05 04:13 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:04 / KC
Nickel	15.9	mg/kg		5.0		SW6020	04/27/05 01:44 / rlh
Phosphorus	707	mg/kg		10		SW6010B	04/22/05 04:13 / jjw
Selenium	12.7	mg/kg		5.0		SW6020	04/27/05 01:44 / rlh
Zinc	18500	mg/kg		5.0		SW6010B	04/22/05 04:13 / jjw
VOLATILE ORGANIC COMPOUNDS							
Bromoform	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Benzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Bromobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Bromochloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Bromodichloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Bromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Carbon tetrachloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Chlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Chloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
2-Chloroethyl vinyl ether	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Chloroform	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Chloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
2-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
4-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Chlorodibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,2-Dibromoethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Dibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,2-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-005
Client Sample ID: ASP05-C9

Report Date: 05/02/05
Collection Date: 04/14/05 14:44
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
1,3-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,4-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Dichlorodifluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,2-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
cis-1,2-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
trans-1,2-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,3-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
2,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
cis-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
trans-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Ethylbenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Methyl tert-butyl ether (MTBE)	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Methylene chloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Methyl ethyl ketone	ND	mg/kg		4.0		SW8260B	04/21/05 17:16 / trr
Styrene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1,1,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1,2,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Tetrachloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Toluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1,1-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,1,2-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Trichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Trichlorofluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
1,2,3-Trichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Vinyl chloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
m+p-Xylenes	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
o-Xylene	ND	mg/kg		0.20		SW8260B	04/21/05 17:16 / trr
Surr: p-Bromofluorobenzene	118	%REC			78-160	SW8260B	04/21/05 17:16 / trr
Surr: Dibromofluoromethane	104	%REC			70-132	SW8260B	04/21/05 17:16 / trr
Surr: 1,2-Dichloroethane-d4	104	%REC			60-136	SW8260B	04/21/05 17:16 / trr
Surr: Toluene-d8	104	%REC			75-138	SW8260B	04/21/05 17:16 / trr
SEMI-VOLATILE ORGANIC COMPOUNDS							
Acenaphthene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Acenaphthylene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Benzo(a)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm

Report Definitions: RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-005
Client Sample ID: ASP05-C9

Report Date: 05/02/05
Collection Date: 04/14/05 14:44
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
SEMI-VOLATILE ORGANIC COMPOUNDS							
Benzo(a)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Benzo(b)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Benzo(g,h,i)perylene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Benzo(k)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Chrysene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Dibenzo(a,h)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Fluorene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Indeno(1,2,3-cd)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Naphthalene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Phenanthrene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 14:39 / sm
Surr: 2-Fluorobiphenyl	88.6	%REC			30-115	SW8270C	04/21/05 14:39 / sm
Surr: Nitrobenzene-d5	86.9	%REC			23-120	SW8270C	04/21/05 14:39 / sm
Surr: Terphenyl-d14	98.9	%REC			18-137	SW8270C	04/21/05 14:39 / sm
POLYCHLORINATED BIPHENYLS (PCB'S)							
Aroclor 1016	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1221	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1232	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1242	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1248	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1254	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1260	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1262	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Aroclor 1268	ND	mg/kg		0.017		SW8082	04/24/05 03:40 / law
Surr: Decachlorobiphenyl	140	%REC	S		50-126	SW8082	04/24/05 03:40 / law
Surr: Tetrachloro-m-xylene	108	%REC			42-115	SW8082	04/24/05 03:40 / law

Sample extract received a Sulfuric Acid Clean-up (EPA Method 3665) and a Sulfur Clean-up (EPA Method 3660) prior to analysis.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
S - Spike recovery outside of advisory limits.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-006
Client Sample ID: ASP06-D16

Report Date: 05/02/05
Collection Date: 04/14/05 14:50
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	42.5	mg/kg		5.0		SW6020	04/27/05 01:51 / rlh
Arsenic	130	mg/kg		5.0		SW6020	04/27/05 01:51 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:17 / jjw
Cadmium	2.2	mg/kg		1.0		SW6010B	04/20/05 19:46 / jjw
Chromium	68.4	mg/kg		5.0		SW6010B	04/20/05 19:46 / jjw
Cobalt	173	mg/kg		5.0		SW6010B	04/20/05 19:46 / jjw
Iron	305000	mg/kg	D	80		SW6010B	04/22/05 04:17 / jjw
Lead	55.5	mg/kg		5.0		SW6010B	04/20/05 19:46 / jjw
Manganese	11800	mg/kg		5.0		SW6010B	04/22/05 04:17 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:06 / KC
Nickel	18.8	mg/kg		5.0		SW6020	04/27/05 01:51 / rlh
Phosphorus	647	mg/kg		10		SW6010B	04/22/05 04:17 / jjw
Selenium	11.0	mg/kg		5.0		SW6020	04/27/05 01:51 / rlh
Zinc	19100	mg/kg		5.0		SW6010B	04/22/05 04:17 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-007
Client Sample ID: ASP07-F3

Report Date: 05/02/05
Collection Date: 04/14/05 14:57
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	42.7	mg/kg		5.0		SW6020	04/27/05 01:58 / rlh
Arsenic	102	mg/kg		5.0		SW6020	04/27/05 01:58 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:20 / jjw
Cadmium	1.9	mg/kg		1.0		SW6010B	04/20/05 19:49 / jjw
Chromium	70.5	mg/kg		5.0		SW6010B	04/20/05 19:49 / jjw
Cobalt	171	mg/kg		5.0		SW6010B	04/20/05 19:49 / jjw
Iron	266000	mg/kg	D	80		SW6010B	04/22/05 04:20 / jjw
Lead	45.3	mg/kg		5.0		SW6010B	04/20/05 19:49 / jjw
Manganese	12100	mg/kg		5.0		SW6010B	04/22/05 04:20 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:10 / KC
Nickel	17.4	mg/kg		5.0		SW6020	04/27/05 01:58 / rlh
Phosphorus	578	mg/kg		10		SW6010B	04/22/05 04:20 / jjw
Selenium	13.8	mg/kg		5.0		SW6020	04/27/05 01:58 / rlh
Zinc	19100	mg/kg		5.0		SW6010B	04/22/05 04:20 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-008
Client Sample ID: ASP08-G2

Report Date: 05/02/05
Collection Date: 04/14/05 15:04
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Moisture	0.800	wt%		0.0100		SW3550A	04/22/05 08:15 / MC
CHEMICAL CHARACTERISTICS							
pH, 1:2	9.2	s.u.		0.1		ASA10-3	04/25/05 16:18 / srm
Chloride, 1:2	1.06	mg/kg		1.00		ASA10-3	04/26/05 12:48 / qed
METALS, TOTAL							
Antimony	43.8	mg/kg		5.0		SW6020	04/27/05 02:05 / rlh
Arsenic	119	mg/kg		5.0		SW6020	04/27/05 02:05 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:24 / jjw
Cadmium	2.5	mg/kg		1.0		SW6010B	04/20/05 20:00 / jjw
Chromium	59.8	mg/kg		5.0		SW6010B	04/20/05 20:00 / jjw
Cobalt	194	mg/kg		5.0		SW6010B	04/20/05 20:00 / jjw
Iron	290000	mg/kg	D	80		SW6010B	04/22/05 04:24 / jjw
Lead	116	mg/kg		5.0		SW6010B	04/20/05 20:00 / jjw
Manganese	13100	mg/kg		5.0		SW6010B	04/22/05 04:24 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:12 / KC
Nickel	17.9	mg/kg		5.0		SW6020	04/27/05 02:05 / rlh
Phosphorus	720	mg/kg		10		SW6010B	04/22/05 04:24 / jjw
Selenium	9.9	mg/kg		5.0		SW6020	04/27/05 02:05 / rlh
Zinc	21100	mg/kg		5.0		SW6010B	04/22/05 04:24 / jjw
VOLATILE ORGANIC COMPOUNDS							
Bromoform	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Benzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Bromobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Bromochloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Bromodichloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Bromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Carbon tetrachloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Chlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Chloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
2-Chloroethyl vinyl ether	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Chloroform	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Chloromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
2-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
4-Chlorotoluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Chlorodibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,2-Dibromoethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Dibromomethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,2-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-008
Client Sample ID: ASP08-G2

Report Date: 05/02/05
Collection Date: 04/14/05 15:04
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
1,3-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,4-Dichlorobenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Dichlorodifluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,2-Dichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
cis-1,2-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
trans-1,2-Dichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,3-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
2,2-Dichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
cis-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
trans-1,3-Dichloropropene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Ethylbenzene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Methyl tert-butyl ether (MTBE)	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Methylene chloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Methyl ethyl ketone	ND	mg/kg		4.0		SW8260B	04/21/05 17:51 / trr
Styrene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1,1,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1,2,2-Tetrachloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Tetrachloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Toluene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1,1-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,1,2-Trichloroethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Trichloroethene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Trichlorofluoromethane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
1,2,3-Trichloropropane	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Vinyl chloride	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
m+p-Xylenes	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
o-Xylene	ND	mg/kg		0.20		SW8260B	04/21/05 17:51 / trr
Surr: p-Bromofluorobenzene	112	%REC			78-160	SW8260B	04/21/05 17:51 / trr
Surr: Dibromofluoromethane	103	%REC			70-132	SW8260B	04/21/05 17:51 / trr
Surr: 1,2-Dichloroethane-d4	102	%REC			60-136	SW8260B	04/21/05 17:51 / trr
Surr: Toluene-d8	108	%REC			75-138	SW8260B	04/21/05 17:51 / trr
SEMI-VOLATILE ORGANIC COMPOUNDS							
Acenaphthene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Acenaphthylene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Benzo(a)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm

Report Definitions: RL - Analyte reporting limit. MCL - Maximum contaminant level.
QCL - Quality control limit. ND - Not detected at the reporting limit

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-008
Client Sample ID: ASP08-G2

Report Date: 05/02/05
Collection Date: 04/14/05 15:04
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
SEMI-VOLATILE ORGANIC COMPOUNDS							
Benzo(a)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Benzo(b)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Benzo(g,h,i)perylene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Benzo(k)fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Chrysene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Dibenzo(a,h)anthracene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Fluoranthene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Fluorene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Indeno(1,2,3-cd)pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Naphthalene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Phenanthrene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Pyrene	ND	mg/kg		0.33		SW8270C	04/21/05 15:21 / sm
Surr: 2-Fluorobiphenyl	75.9	%REC			30-115	SW8270C	04/21/05 15:21 / sm
Surr: Nitrobenzene-d5	76.0	%REC			23-120	SW8270C	04/21/05 15:21 / sm
Surr: Terphenyl-d14	88.9	%REC			18-137	SW8270C	04/21/05 15:21 / sm
POLYCHLORINATED BIPHENYLS (PCB'S)							
Aroclor 1016	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1221	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1232	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1242	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1248	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1254	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1260	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1262	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Aroclor 1268	ND	mg/kg		0.017		SW8082	04/24/05 04:08 / law
Surr: Decachlorobiphenyl	125	%REC			50-126	SW8082	04/24/05 04:08 / law
Surr: Tetrachloro-m-xylene	90.0	%REC			42-115	SW8082	04/24/05 04:08 / law

Sample extract received a Sulfuric Acid Clean-up (EPA Method 3665) and a Sulfur Clean-up (EPA Method 3650) prior to analysis.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-009
Client Sample ID: ASP09-G4

Report Date: 05/02/05
Collection Date: 04/14/05 15:07
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	57.6	mg/kg		5.0		SW6020	04/27/05 02:12 / rlh
Arsenic	109	mg/kg		5.0		SW6020	04/27/05 02:12 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:27 / jjw
Cadmium	1.4	mg/kg		1.0		SW6010B	04/20/05 20:04 / jjw
Chromium	90.0	mg/kg		5.0		SW6010B	04/20/05 20:04 / jjw
Cobalt	204	mg/kg		5.0		SW6010B	04/20/05 20:04 / jjw
Iron	294000	mg/kg	D	80		SW6010B	04/22/05 04:27 / jjw
Lead	64.0	mg/kg		5.0		SW6010B	04/20/05 20:04 / jjw
Manganese	11900	mg/kg		5.0		SW6010B	04/22/05 04:27 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:14 / KC
Nickel	20.6	mg/kg		5.0		SW6020	04/27/05 02:12 / rlh
Phosphorus	562	mg/kg		10		SW6010B	04/22/05 04:27 / jjw
Selenium	12.2	mg/kg		5.0		SW6020	04/27/05 02:12 / rlh
Zinc	20100	mg/kg		5.0		SW6010B	04/22/05 04:27 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: ASARCO Slag Pile
Lab ID: H05040130-010
Client Sample ID: ASP10-H16

Report Date: 05/02/05
Collection Date: 04/14/05 15:15
Date Received: 04/14/05
Matrix: Solid

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
METALS, TOTAL							
Antimony	34.1	mg/kg		5.0		SW6020	04/22/05 05:23 / rlh
Arsenic	117	mg/kg		5.0		SW6020	04/22/05 05:23 / rlh
Beryllium	ND	mg/kg		5.0		SW6010B	04/22/05 04:31 / jjw
Cadmium	2.1	mg/kg		1.0		SW6010B	04/20/05 20:07 / jjw
Chromium	59.0	mg/kg		5.0		SW6010B	04/20/05 20:07 / jjw
Cobalt	137	mg/kg		5.0		SW6010B	04/20/05 20:07 / jjw
Iron	305000	mg/kg	D	80		SW6010B	04/22/05 04:31 / jjw
Lead	103	mg/kg		5.0		SW6010B	04/20/05 20:07 / jjw
Manganese	10400	mg/kg		5.0		SW6010B	04/22/05 04:31 / jjw
Mercury	ND	mg/kg		1.0		SW7471A	04/25/05 14:16 / KC
Nickel	14.7	mg/kg		5.0		SW6020	04/22/05 05:23 / rlh
Phosphorus	710	mg/kg		10		SW6010B	04/22/05 04:31 / jjw
Selenium	9.1	mg/kg		5.0		SW6020	04/22/05 05:23 / rlh
Zinc	22200	mg/kg		5.0		SW6010B	04/22/05 04:31 / jjw

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

APPENDIX 4-1-2

SUMMARY OF SLAG TESTING ANALYSES INCLUDING TEST BASIN WATER QUALITY, SLAG BOTTLE ROLL TESTS AND EP TOXICITY TESTS

SITE NAME	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG	FUMED SLAG
SAMPLE DATE	12/30/86	04/02/87	04/22/87	04/22/87	05/22/87	05/22/87	05/22/87	05/22/87	07/15/87	07/15/87
LAB	ASARCO	ASARCO	ASARCO	CHMTC	ASARCO	ASARCO	CHMTC	CHMTC	ASARCO	ASARCO
REMARKS	BOTTLE			SPLIT	REPLICATE		SPLIT	REPLICATE	REPLICATE	
REMARKS	ROLL TEST									
SAMPLE NUMBER		8704-1	8704-20		8705-50	8705-47			8707-02	8707-01
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)			7.5			9.7				
SPEC. COND. (UMHOS/CM) FIELD			2235		2268	2265			2137	2150
SPEC. COND. (UMHOS/CM) LAB	115	1950	2250			2320				2400
PH FIELD			6.16 *		7.48	7.69				7.46
PH LAB	9.9	7.77	6.81			7.52				7.55
TDS MEAS. @ 180 DEG. C	94	1842	1703 *	993		2086	2227			1912 *
OXYGEN (O) DISS			4.3			4.3				4.1
DEPTH TO SWL BELOW MP (FT)			8.74 *			8.01				
COMMON IONS										
CALCIUM (CA)	12	510	454	449.0		422	417.0	412.0		321
MAGNESIUM (MG)	0.49	20	25.5	27.40		20.2	25.10	24.90		22.9
SODIUM (NA)	5.1	74	71.5	76.6		85	72.5	71.8		74
POTASSIUM (K)	3.9	54	65	60.80		74	136.00	122.00		68
BICARBONATE (HCO3) (LAB)	<1.0	260 *	102			98				84
CARBONATE AS CO3 (LAB)	19	<1	<1			<1				<1.0
SULFATE (SO4)	10	1450	1425	1240.0		1338	1304.0			1200
CHLORIDE (CL)	18	6.0	7.0	10.0		7.0	30.0			4.0
TRACE ELEMENTS										
ARSENIC (AS) DISS	0.19	0.0325	0.0283	0.0193	0.038	0.030	0.0530	0.0320	0.057 *	0.039 *
ARSENIC (AS) +3			0.014						0.0216	0.040 *
ARSENIC (AS) +5			0.010						0.0722 *	0.0268
CADMIUM (CD) DISS	0.003	0.075	0.060	0.0720	0.051	0.051	0.0520	0.0500	0.055	0.049
COPPER (CU) DISS	0.008	0.280 *	0.193	0.2260	0.125	0.128	0.1480	0.1340	0.118	0.110
IRON (FE) DISS	0.11	<0.020	<0.020	<0.100	0.044	0.045	<0.100	<0.100	<0.020	<0.020
IRON (FE II)			0.010 *						0.060	0.080
LEAD (PB) DISS	<0.017	0.045 *	0.030 *	0.0334	0.019	0.020	0.0323	0.0432	0.016	0.021
MANGANESE (MN) DISS	<0.017	1.080	1.440	2.640	1.910	1.930	2.660	2.640	2.930	2.890
ZINC (ZN) DISS	0.023	3.580	3.700	4.450	2.830	2.890	2.860	2.820	2.500	2.300

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 03-19-1989
HWD-4/86-R1

...RY OF SLAG WATER QUALITY ANALYSES - ASARCO EAST HELENA

SITE NAME	FUMED SLAG	FUMED SLAG	UNFUMED SLAG	UNFUMED SLAG	UNFUMED SLAG	UNFUMED SLAG	UNFUMED SLAG	UNFUMED SLAG	UNFUMED SLAG
SAMPLE DATE	09/22/87	09/22/87	12/30/86	04/22/87	04/22/87	05/22/87	05/22/87	07/15/87	09/22/87
LAB	ASARCO	ASARCO	ASARCO	ASARCO	CHMTC	CHMTC	ASARCO	ASARCO	ASARCO
REMARKS	REPLICATE		BOTTLE ROLL TEST		SPLIT	SPLIT			
REMARKS									
SAMPLE NUMBER	8709-06	8709-04		8704-24			8705-48	8707-03	8709-07
PHYSICAL PARAMETERS									
WATER TEMPERATURE (C)		16 *		10.5			10.9		17 *
SPEC. COND. (UMHOS/CM) FIELD	1368	1366		14296 *			19978	19850	
SPEC. COND. (UMHOS/CM) LAB		1350	200	16500			20200	22000	12200
PH FIELD				9.49			9.97 *	9.48	
PH LAB		7.63	10.4	9.25			9.6	9.73	9.69
TDS MEAS. @ 180 DEC. C		1114	206	14183 *	7298	18720	18523	18172 *	10984
OXYGEN (O) DISS		4.0		4.5			3.2	3.0	4.1
DEPTH TO SWL BELOW MP (FT)		7.74		8.83			7.85		7.02
COMMON IONS									
CALCIUM (CA)		126.5	17	371	437.0		361	434	345
MAGNESIUM (MG)		11	0.22	8.5	8.76		6.7	6.4	4.2
SODIUM (NA)		45	19	2900	2960.0		3890	3800	2200
POTASSIUM (K)		65	22	1950	158.00		2650	2550	1540
ALKALINITY AS CACO3 (LAB)							587		
BICARBONATE (HCO3) (LAB)		72	(1.0	486 *			(1	(1.0	(1.0
CARBONATE AS CO3 (LAB)		(1.0	36	(1			284	163	197
HYDROXIDE (OH)							38	46	30
SULFATE (SO4)		480 *	16	9200	2480.0	2463.0	1200	11750	6750
CHLORIDE (CL)		3.0	16	57	63.0	75.0	66	74	35
TRACE ELEMENTS									
ARSENIC (AS) DISS	0.075 *	0.054 *	0.31	0.620	0.5130		0.353	0.590 *	0.553
ARSENIC (AS) +3				0.400				0.550	
ARSENIC (AS) +5				0.030				0.054	
CADMIUM (CD) DISS	0.021	0.021	0.003	0.030 *	0.0063		0.003	0.005	0.003
COPPER (CU) DISS	0.055	0.056	0.008	0.130	0.1190		0.128	0.085	0.043
IRON (FE) DISS	(0.020	(0.020	0.070	0.150	(0.100		0.225 *	(0.020	(0.020
IRON (FE II)	0.02	(0.01		(0.010				0.070	(0.01
LEAD (PB) DISS	0.023	0.024	0.083	0.098 *	0.1430		0.0505	0.021 *	0.094
MANGANESE (MN) DISS	1.590	1.540	(0.017	0.155 *	0.139		0.083	0.090	0.050
ZINC (ZN) DISS	0.813	0.788 *	0.053	0.100 *	0.090		0.048	0.030	0.023

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested. Output Date: 03-19-1989

TABLE 1
East Helena

SLAG SAMPLE LEACHATE ANALYSIS

1979

979
SARCO

ab No.	Description	(PPM in Leachate) As	Ba	Cd	Cr	Pb	Hg	Se	Ag	(Zn)
3278	Slag 1 (Z)	.018	.3	.08	<.01	.6	<.001	<.005	<.01	3.5
3279	Slag 2 (Z-)	<.014	.1	.13	<.01	<.1	<.001	<.005	<.01	2.6
3280	Slag 3 (Z)	.020	.1	.03	<.01	3.4	<.001	<.005	<.01	2.1
3281	Slag 4 (Z-)	<.014	.2	<.01	<.01	<.1	<.001	<.005	<.01	1.0
3282	Slag 5 (Pb)	.032	.2	<.01	<.01	3.3	<.001	<.005	<.01	5.0
3	Slag 6 (Pb)	<.014	.1	.15	<.01	1.0	<.001	<.005	<.01	6.0
	aximum Contaminant evels for Non-oxic Leachates	0.5	10.0	0.1	0.5	0.5	.02	0.1	0.5	---*

NOTE →

* Currently unspecified but estimated to be 50 ppm (10 times the Drinking Water Standard).

-.K3

ASARCO Incorporated
Department of Environmental Sciences
EAST HELENA
Miscellaneous Sample Results

ASARCO LAB #	SAMPLE DESCRIPTION	1985 SAMPLE DATE	As ppm	Cd ppm	Pb ppm
3658 Air Cooled	Blast Furnace Slag	5/ 7	.12	.002	5.3
3659 Granulated	Blast Furnace Slag	5/ 7	.047	<.002	.050

ASARCO Incorporated
Department of Environmental Sciences
EAST HELENA
Miscellaneous Sample Results

ASARCO LAB #	SAMPLE DESCRIPTION	1985 SAMPLE DATE	Ag ppm	As ppm	Ba ppm	Cd ppm	C ppm
7860	TCLP-Fumed Blast Furnace Slag	10/21	<.002	.45	4.6	.007	.
7861	TCLP-Unfumed Blast Furnace Slag	10/21	<.002	1.2	1.6	.25	.

ASARCO LAB #	SAMPLE DESCRIPTION	1985 SAMPLE DATE	Hg ppb	Pb ppm	Se ppm
7860	TCLP-Fumed Blast Furnace Slag	10/21	<.005	.28	.004
7861	TCLP-Unfumed Blast Furnace Slag	10/21	<.001	10.	.010

ASARCO Incorporated
Department of Environmental Sciences
EAST HELENA
Miscellaneous Sample Results

ASARCO LAB #	SAMPLE DESCRIPTION	1985 SAMPLE DATE	Ag ppm	As ppm	Ba ppm	Cd ppm
6378	Air Cooled Slag	8/15	<.005	.012	<1.0	.002
6379	Granulated Slag	8/15	<.005	.010	<1.0	<.002

ASARCO LAB #	SAMPLE DESCRIPTION	1985 SAMPLE DATE	Hg ppb	Pb ppm	Se ppm	pH
6378	Air Cooled Slag	8/15	<.50	1.1	<.080	9.2
6379	Granulated Slag	8/15	<.50	.050	<.080	8.0

ASARCO Incorporated
Department of Environmental Sciences
EAST HELENA
Miscellaneous Sample Results

ASARCO LAB #	SAMPLE DESCRIPTION	1983 SAMPLE DATE	Pb ppm	Cd ppm	Cr ppm	Ag ppm	Ba ppm
11370	2-4 mo. old Slag Composite	11/28	9.8	3.9	<.030	<.008	7.2
11371	1 week old Slag Composite	11/28	3.9	<.004	<.030	<.008	8.7

ASARCO LAB #	SAMPLE DESCRIPTION	1983 SAMPLE DATE	As ppm	Se ppm	Hg ppb	pH
11370	2-4 mo. old Slag Composite	11/28	.20	.012	<.50	10.
11371	1 week old Slag Composite	11/28	.35	<.004	<.50	10.

	ppm							
	Ba	Pb	Cd	Cr	Ag	Se	Hg	As
Maximum allowable levels of contaminants in the leachate of a non-toxic material.....	100.	5.0	1.0	5.0	5.0	1.0	.2	5.0

storage area. The sediments are being stored in a protected environment to prevent contamination of the adjacent area from dispersion of the sediments by wind and water. The sediments are located on a concrete pad to prevent contact with adjacent soils. A containment berm around the perimeter of the sediment pile diverts run-on. A geomembrane cover over the sediments prevents wind and water dispersion and eliminates subsequent generation of leachate.

Approximately 31,000 cubic yards of dewatered sediments were transported to the Lower Ore Storage Area. Four thousand cubic yards of these sediments were smelted prior to the stockpile being covered with a geomembrane liner in October 1997. The sediments will remain in this interim storage facility while EPA considers Asarco's request to modify the sediment smelting requirement of the ROD, and instead dispose of these materials in the on-site CAMU.

4.1.4 Slag

The effect of the slag pile on groundwater and surface water was evaluated as part of the 1990 Comprehensive RI/FS. The evaluation was conducted in accordance with procedures presented in the Comprehensive RI/FS Work Plan (Hydrometrics 1987). Based on the results of the evaluation, the RI/FS concluded that the potential for impacts to groundwater and surface water from slag is low and the subsequent ROD did not specify any remedial action for the Slag Pile Operable Unit. Post-RI/FS monitoring at adjacent surface water and groundwater monitoring sites is on-going. A summary of the slag investigation and the findings of the RI relative to slag are presented below.

4.1.4.1 Investigation of Potential Groundwater Impacts

Slag Infiltration Test Basin Construction, Water Level Measurement, Water Quality Sampling and Analysis

Infiltration and percolation of precipitation into the slag pile were directly measured in slag test basins constructed in fumed and unfumed slag. Fumed slag is a by-product of the zinc

recovery process, which consisted of air injection into molten slag to recover zinc oxide. Unfumed slag is a by-product of the blast furnace which has not been further processed through the zinc recovery process. The zinc recovery process was suspended in 1982 and zinc is no longer recovered from the slag. Since 1982, unfumed slag has been placed in an area segregated from fumed slag.

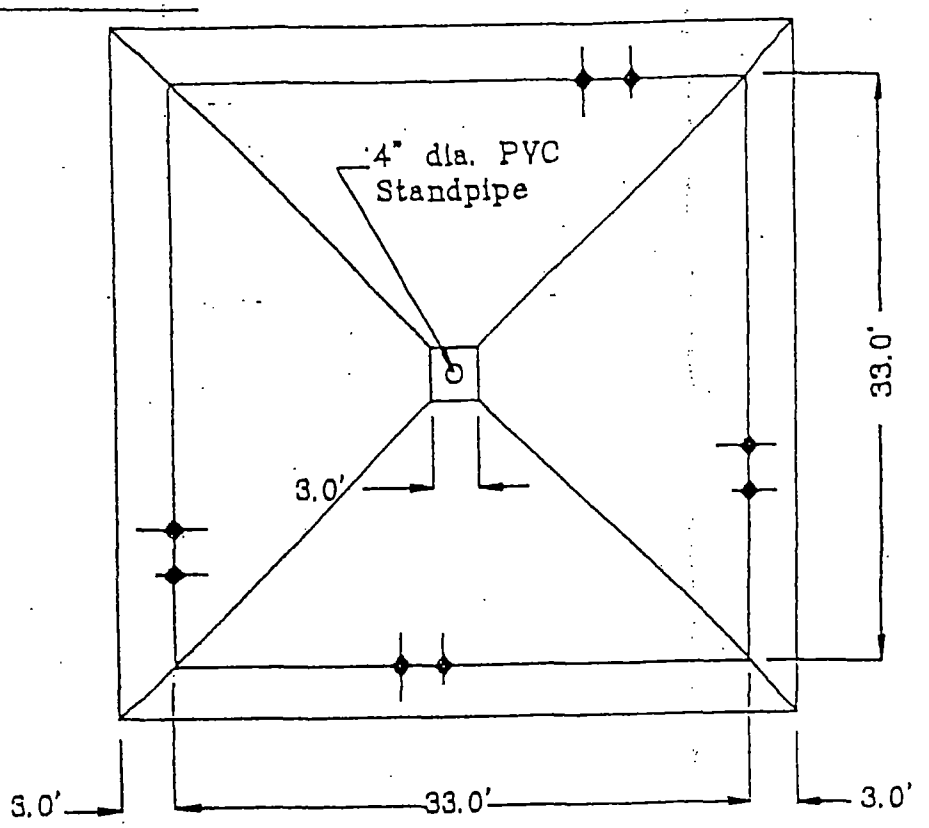
Two slag infiltration catchment basins were constructed; one in a typical location in the fumed slag, and one in a typical location in unfumed slag. Construction of the test basins included removal of a 2 to 3 meter layer of slag, placement of an impervious 36-mil reinforced Hypalon liner in the excavation, installation of a collection sump, and replacement of the slag. Figure 4-1-8 shows the slag test basin design.

Water elevations in the collection sumps were measured periodically, and after rainfall or snowmelt events to determine the actual accumulation of water in the slag basins. Collected water was pumped from the sump, sent to the TSC laboratory, and tested for the parameters listed in Table 3-2-2. Analytical results of water collected in the test basins are summarized in Appendix 4-1-2.

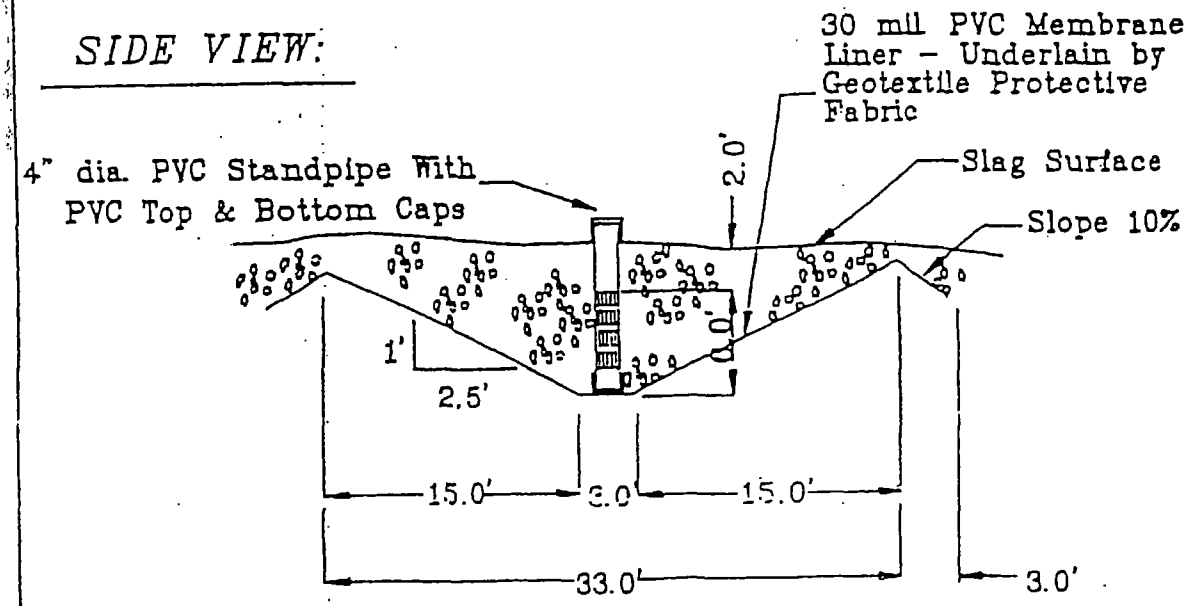
Slag Material Sampling and Analysis

To supplement slag information collected from the test basins, samples of slag were collected from the test basin sites and sent to the TSC lab for "bottle roll" tests. Estimates of slag leachability were obtained by conducting "bottle roll" test on slag samples. Bottle roll tests involved placing samples of slag in bottles in the laboratory, adding deionized water, agitating the bottles for approximately 24 hours, then analyzing the water for concentrations of arsenic and metals. Details of the bottle roll extraction tests are in the Quality Assurance Project Plan (QAPP) Addendum to the Phase II Water Resources Investigation Work Plan (Hydrometrics, 1986). Bottle roll test results are in Appendix 4-1-2.

PLAN VIEW:



SIDE VIEW:



NOTE: PVC Standpipe is schedule 40, capped on both ends and perforated with saw-cut slots from 2.0' to 8.0' beneath the slag surface.

In addition to the slag sampling and bottle roll test performed as part of the East Helena RI activities, additional slag samples were collected and analyzed using the EP toxicity procedure. Results of these analyses are also in Appendix 4-1-2.

Assessment of Groundwater Impacts

In an effort to estimate infiltration rates, the volume of water retained in the slag test basins was calculated for 13 time intervals, beginning December 23, 1986 and ending February 10, 1988. These volumes were compared to the volumes of precipitation during the same periods and converted to percentages, as summarized in Table 4-1-10. The percentage of precipitation retained in the basins varied from -6.7% to 61.9% in the fumed slag, and -45% to 61.8% in the unfumed slag (negative percentages indicate evaporation rates exceed precipitation collected in the test basins). Although there is a relationship of test basin water level fluctuations to precipitation (see Figures 4-1-9 and 4-1-10), the relationship may be complicated by variable evaporation, hence, infiltration rates are variable.

Concentrations of arsenic and metals from test basin water samples (see Appendix 4-1-2) were low compared to plant area groundwater. Dissolved arsenic varied from 0.0198 mg/l to 0.075 mg/l in the fumed slag, and 0.353 to 0.590 mg/l in the unfumed slag during the study period. Dissolved cadmium varied from 0.003 to 0.075 mg/l in the fumed slag, and 0.003 to 0.0063 mg/l in the unfumed slag. Dissolved lead varied from 0.016 to 0.045 mg/l in the fumed slag, and 0.021 to 0.098 mg/l in the unfumed slag.

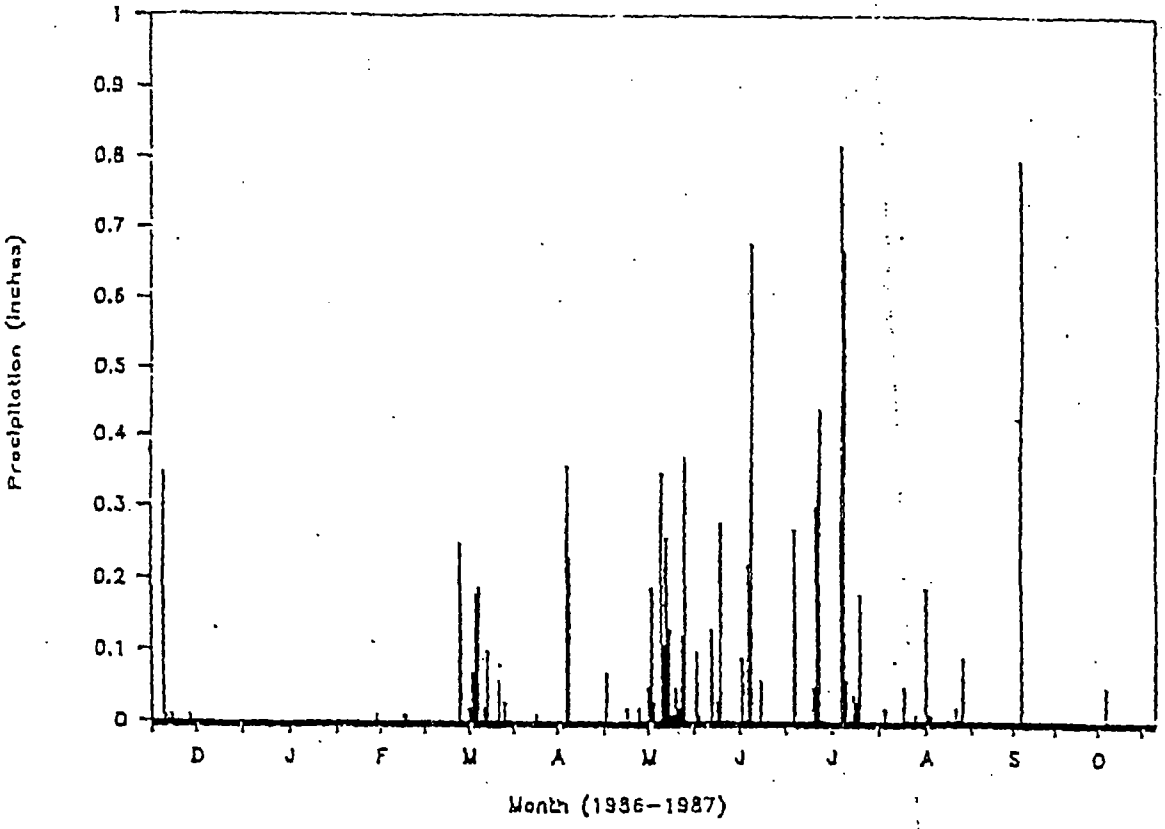
The concentrations of arsenic and metals from bottle roll testing (See Appendix 4-1-2) were similar to the slag test basin water quality. For the fumed slag, dissolved arsenic was 0.19 mg/l, cadmium was 0.003 mg/l, and lead was less than 0.017 mg/l. For the unfumed slag, dissolved arsenic was 0.31 mg/l, cadmium was 0.003 mg/l and lead was 0.083 mg/l.

EP toxicity tests (see Appendix 4-1-2) indicate that leachable trace element concentrations from the slag are variable. From 18 tests, the results for arsenic varied from below detection level to 1.2 ppm with an average of 0.16 ppm; cadmium varied from below detection level to

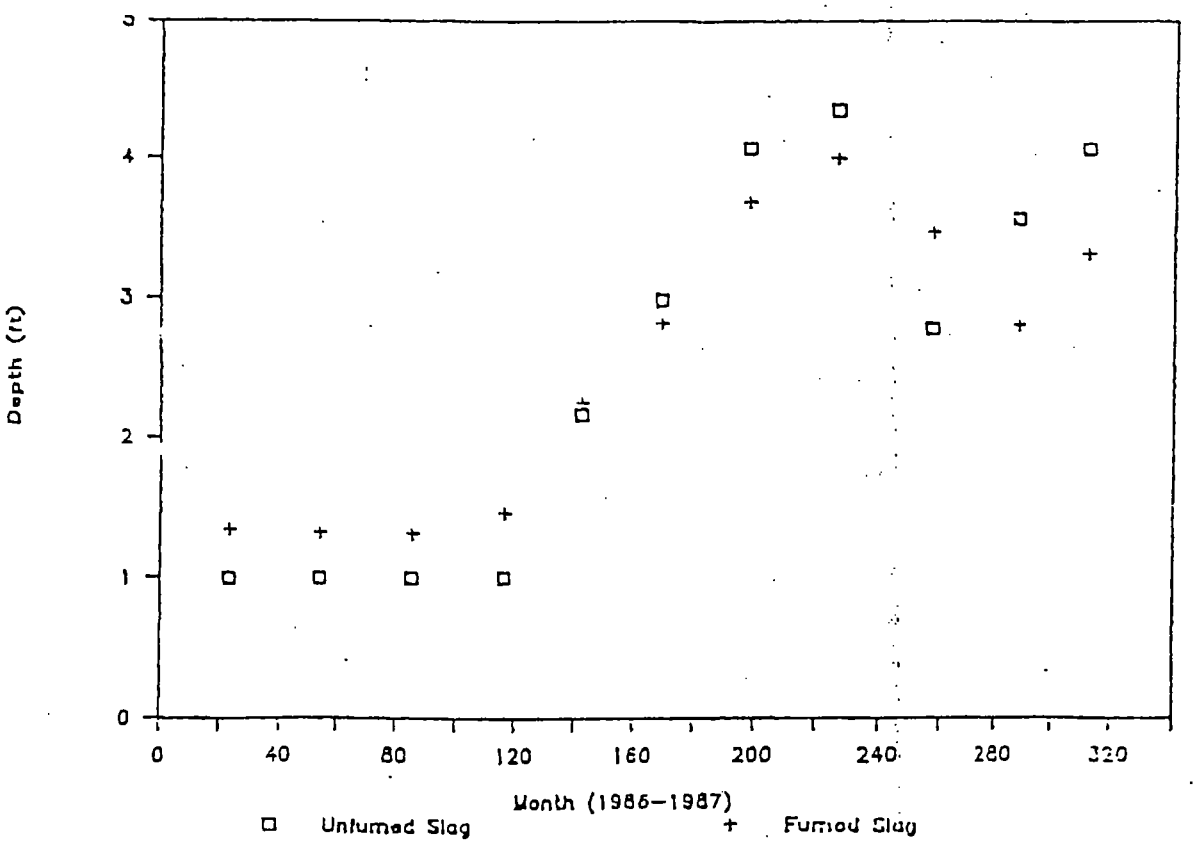
TABLE 4-1-10. PRECIPITATION COLLECTED IN SLAG TEST BASINS

FUMED SLAG			
Date	Precipitation (inches)	Precipitation Retained * (Inches)	Percent of Precipitation Retained
12/23/86			
1/22/86	.0		
2/23/87	0		
3/26/87	0.75	0.01	1.4
4/21/87	0.23	-0.01	-5.8
5/18/87	0.51	0.32	61.9
6/18/87	2.46	0.49	19.8
7/14/87	0.88	0.25	28.7
8/11/87	1.70	0.36	21.2
9/11/87	0.37	not calculated	
10/14/87	0.65	0.25	38.4
12/7/87	0.45	-0.02	-3.9
1/20/88	0.34	-0.02	-6.7
2/10/88	0.49	-0.01	-1.1
UNFUMED SLAG			
12/23/86			
1/22/87	0		
2/23/87	0		
3/26/87	0.75	0	
4/21/87	0.23	0.12	52.7
5/18/87	0.51	0.27	53.6
6/18/87	2.46	0.73	29.8
7/14/87	0.88	0.28	31.7
8/11/87	1.70	0.12	7.2
9/11/87	0.37	not calculated	
10/14/87	0.65	0.40	61.8
12/7/87	0.45	-0.05	-12.1
1/20/88	0.34	-0.15	-45.0
2/10/88	0.49	0.14	27.6

* Value is calculated based on measured water level changes and test basin geometry (Frustum of a general pyramid). Negative values indicate evaporation exceeds infiltration.



CC/RA REPORT ASARCO EAST HELENA FACILITY	DAILY PRECIPITATION AT HELENA AIRPORT	FIGURE 4-1-9



CC/RA REPORT ASARCO EAST HELENA FACILITY	DEPTH OF WATER IN SLAG TEST BASIN	FIGURE 4-1-10

FIGURE SOURCE: COMPREHENSIVE RI/FS (ASARCO, 199

3.9 ppm, with an average of 0.26 ppm (only one cadmium value was greater than 0.25 ppm; if the 3.9 ppm value is dropped, the cadmium average concentration is 0.04 ppm); lead values varied from below detection level to 30 ppm, with an average of 5.2 ppm.

The EP Toxicity tests were not conducted as part of the Comprehensive RI/FS activities, but have been included as supplementary data. The EP Toxicity results tend to overpredict the mobility of metals compared to the other test results and observed site conditions due to the low pH of the extractant. In particular, the values for lead appear to be much higher with TCLP than with natural conditions.

Concentrations of arsenic and other metals in the groundwater system are discussed in detail in Section 4.4. In general, results of water quality from the slag basins and bottle roll analyses of slag indicate arsenic concentrations are significantly lower than concentrations observed in monitoring wells both upgradient and downgradient of the slag pile. Figures 4-1-11, 4-1-12, 4-1-13 and 4-1-14 show a comparison to slag test basin water quality, bottle roll test water quality, EP Tox test results, and groundwater quality upgradient and down gradient of the slag pile.

Based on observed recharge rates in the slag test basins and associated water quality data, the slag pile would account for only 1 to 3 percent of the observed arsenic at downgradient monitoring well DH-10 (see Figure 4-1-15). Concentrations of arsenic in these wells are similar to arsenic concentrations in DH-4 near Lower Lake, the apparent source of elevated arsenic in these wells. Based on the results of test basin water quality analyses and bottle roll te2sts, it is unlikely that slag significantly effects observed arsenic concentration trends on the site.

While EP-Toxicity results indicate that there is some potential for mobility of cadmium, lead and zinc from slag, the results of the test basins and bottle roll tests indicate metals concentrations released from slag is low. In addition, concentrations of cadmium, lead and

FIGURE 4-1-12. CADMIUM CONCENTRATION DATA FROM GROUNDWATER MONITORING WELLS IN THE SLAG PILE AREA, AND FROM SLAG TEST BASIN AND SLAG LEACHABILITY TESTING RESULTS

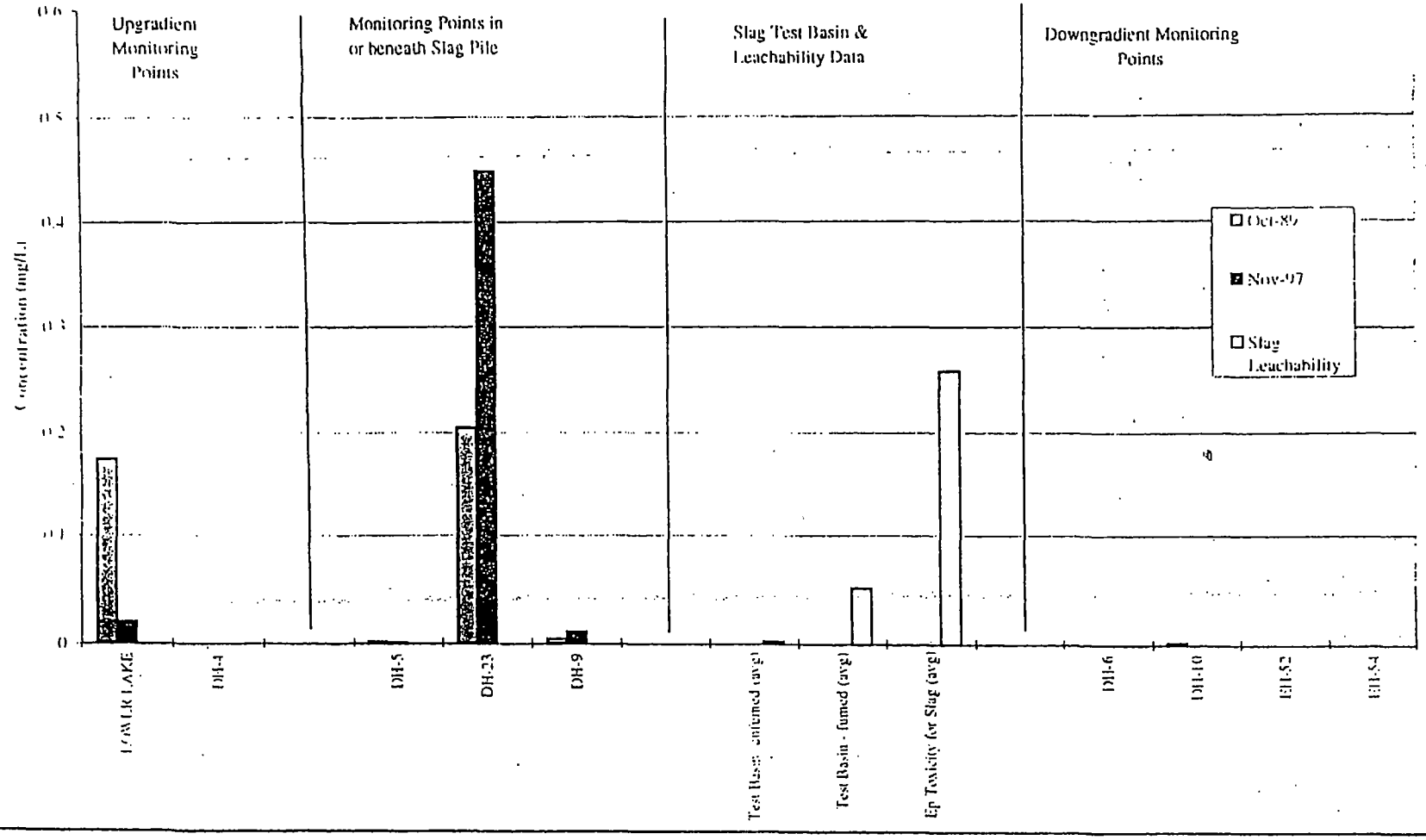


FIGURE 4-1-13. LEAD CONCENTRATION DATA FROM GROUNDWATER MONITORING WELLS IN THE SLAG PILE AREA, AND FROM SLAG TEST BASIN AND SLAG LEACHABILITY TESTING RESULTS

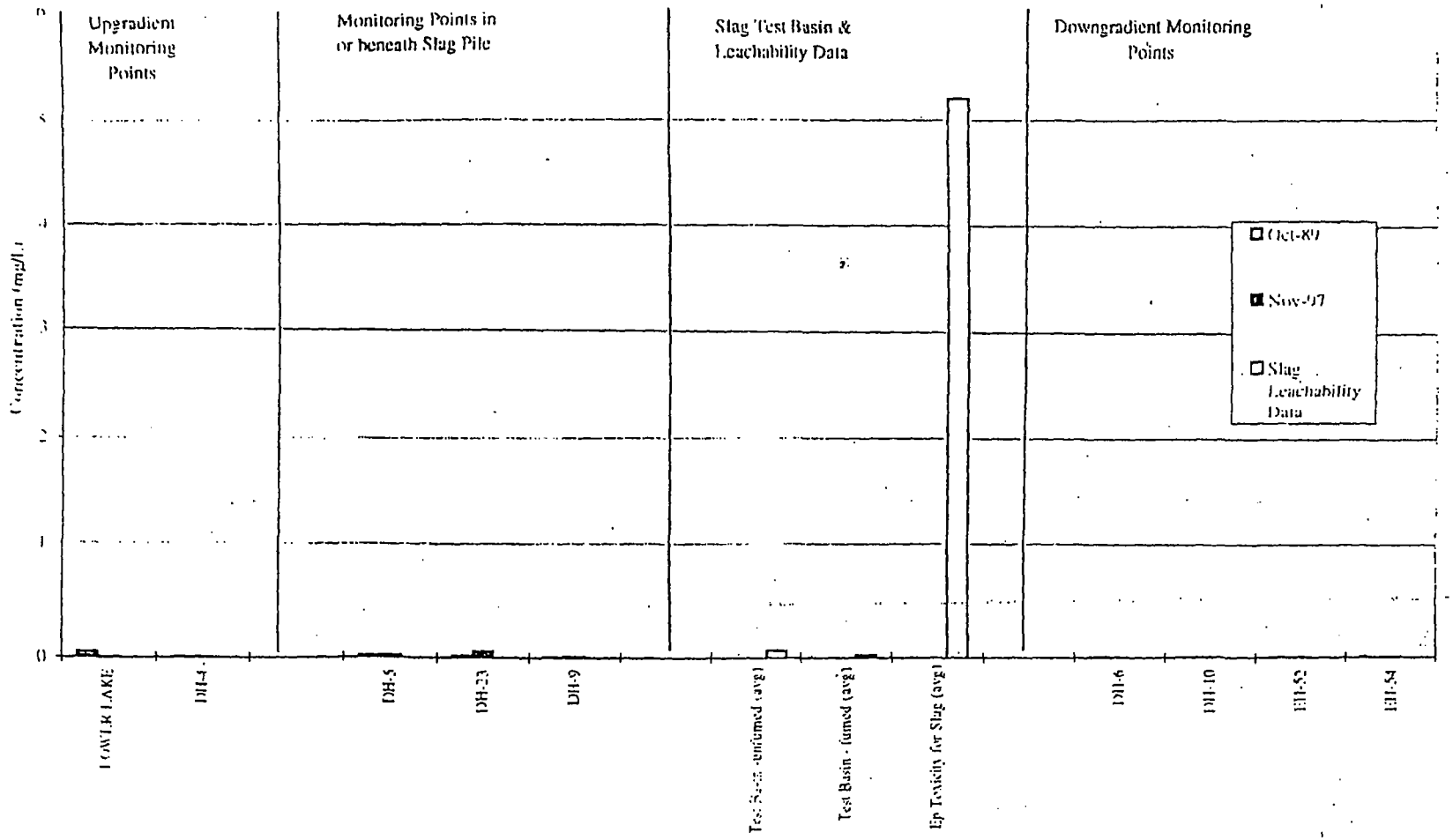


FIGURE 4-1-14. ZINC CONCENTRATION DATA FROM GROUNDWATER MONITORING WELLS IN THE SLAG PILE AREA, AND FROM SLAG TEST BASIN AND SLAG LEACHABILITY TESTING RESULTS

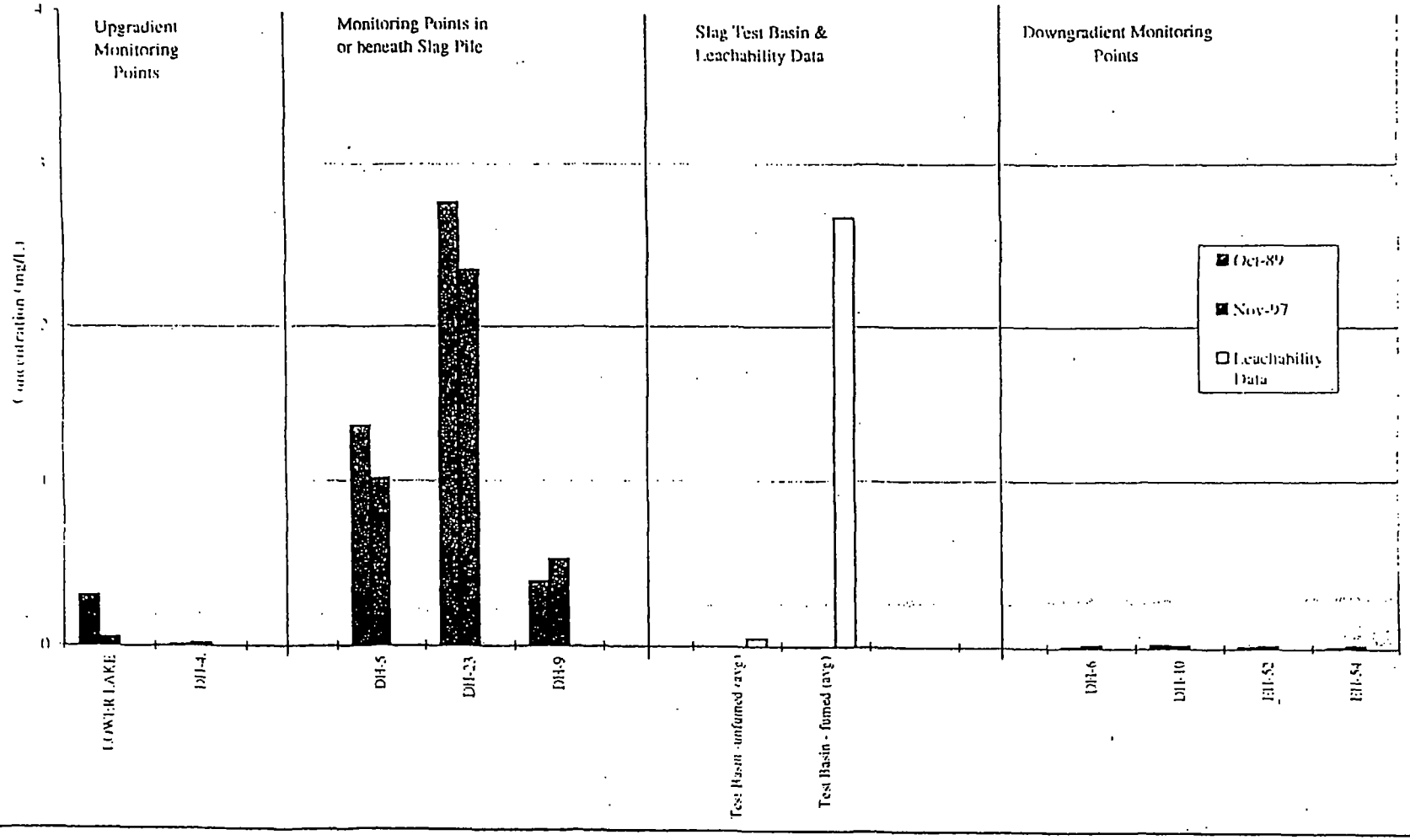


FIGURE 4-1-15. CALCULATED ARSENIC LOADING FROM SLAG VS ARSENIC LOAD IN DOWN-GRADIENT GROUNDWATER

Data Source	Arsenic Conc.(1)	Arsenic Load (2)	% of GW Load (3)
Test Basin Data			
Fumed Slag	0.036 mg/L	0.003 lb/day	0.20%
Unfumed Slag	0.53 mg/L	0.044 lb/day	2.40%
Average	0.28 mg/L	0.022 lb/day	1.30%
Max	0.59 mg/L	0.047 lb/day	2.60%
EP toxicity (avg. of 18 tests)	0.16 mg/L	0.013 lb/day	0.70%
Groundwater Load	2.13 mg/L (4)	1.8 lb/day (4)	

Notes

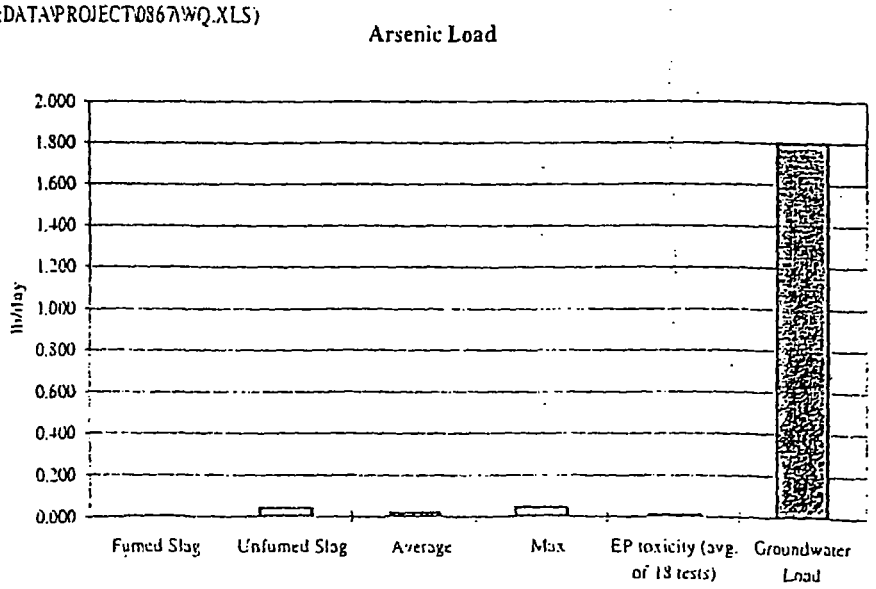
(1) Source RI/FS Appendix 6-1

(2) Slag load calculations assume:
20% infiltration (slag test basin average)
11.3 in/yr ppt
57 acre slag pile area

(3) Calculations based on 1.8 lb/day GW arsenic load assuming.
east side groundwater flux of 70 gpm
east side groundwater arsenic concentration of 2.13 mg/L

(4) Groundwater Load assumptions
Groundwater As Concetration 2.13 mg/L (avg from DH-10)
Groundwater flux = 70 gpm

(K:DATA\PROJECT\0867\WQ.XLS)



zinc is also very low. Based on the results of test basin water quality analyses, bottle roll tests, and down gradient groundwater quality, it is unlikely that slag effects observed groundwater quality trends on the site.

Stratigraphic cross-sections showing the slag pile and underlying stratigraphy (Figure 4-1-16) shows the relationship of the slag pile and underlying strata, including the perched alluvial horizon and the underlying coarser grained alluvial aquifer. Based on monitoring well stratigraphy, it is likely the perched horizon at least partially underlies the slag pile. However, there is no evidence of the perched horizon in downgradient wells (see DH-6 and DH-10). As a result, direct impacts from the slag pile at these wells is unlikely since the perched horizon is absent, and the wells are completed in the coarse grained alluvium. However, as noted above, test basin and laboratory test results indicate potential water quality impacts from the slag are low and are not responsible for the water quality concentration observed in downgradient wells.

4.1.4.2 Potential Surface Water Impacts

The potential for runoff transport in the slag pile area is very low due to the coarse, granular nature of the slag pile, which allows extremely rapid infiltration. Even during high precipitation events no runoff has been observed from the slag pile. Similarly seeps from the face of the slag pile have not been observed. The potential for impacts to surface water are, therefore, limited to direct contact and erosion of the slag pile where it forms steep sided banks adjacent to Prickly Pear Creek. Prickly Pear Creek is in immediate contact with the slag pile between PPC-5 and PPC-6, and adjacent to the slag pile from PPC-6 to PPC-7 (see Exhibit 3-2-1).

The 1990 Comprehensive RI/FS (Hydrometrics, 1990a) examined water quality data from Prickly Pear Creek to assess the potential impact of the slag pile on the creek. No consistent concentration or load increases were apparent in Prickly Pear Creek adjacent to the slag pile (between PPC-5 and PPC-7). The RI/FS therefore concluded that the contribution of arsenic and metals to surface water from slag is very minor. RI/FS and Post RI/FS water quality data

for Prickly Pear Creek are presented and discussed in Section 4.3 of this report and post-RI/FS water quality data are generally consistent with the RI/FS findings. Average metal concentrations show only small differences between stations PPC 5, PPC 7 and PPC 8 (see Figure 4-1-17). Only one high flow stream event (May 1994) shows a pronounced increase in total arsenic load between PPC-5 and PPC-7 (see Figure 4-3-9 in Section 4.3); however, arsenic concentrations decreased from PPC-5 to PPC-7 in the May 1994 event. The calculated load increase is therefore entirely a function of the flow measurement. Since the accuracy of the flow measurements is poor during higher flow events due to increased velocities and turbulence (particularly at PPC-5 below the dam) the apparent load increase during May 1994 is probably the result of flow measurement error. The conclusion of the surface water analysis is that there is little evidence for transport of arsenic and metals from the slag pile with the possible exception being direct erosion of the slag during infrequent high stream flow events.

~~1.2~~4.2 PROCESS FLUIDS

As part of the Comprehensive RI/FS (Hydrometrics 1990a), the Process Fluids Operable Unit was divided into two sub-units: Process Ponds and Process Fluid Transport Circuits.

~~1.1.1~~4.2.1 Process Ponds

The Process Ponds include:

- Lower Lake,
- Former Thornock Lake, and
- The acid plant water treatment facility.

As described in Sections 1 and 3, the Process Ponds were addressed by the Process Ponds RI/FS (Hydrometrics, 1989), a subsequent Process Ponds ROD (US EPA, 1989), and several RD/RA documents, and remedial actions that consisted primarily of sediment excavation. The 1989 Process Pond RI consisted of:

ASARCO TECHNICAL SERVICES CENTER

ANALYTICAL DATA REPORT

East Helena

Technical Services (Project 3101)

Batch No: L010790

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	HOLD DAYS	METHOD
L010790-002	23-MAY-01	FUMED ASARCO SLAG	AG	0.003	%	MJF	18-JUN-01		ICP
			AL	2.32	%	MJF	18-JUN-01		ICP
			AS	0.022	%	MJF	18-JUN-01		ICP
			BA	0.34	%	MJF	18-JUN-01		ICP
			BE	<0.02	%	MJF	18-JUN-01		ICP
			CR	0.036	%	MJF	18-JUN-01		ICP
			CU	0.32	%	MJF	18-JUN-01		ICP
			HG	2.7	ppm	MO	21-JUN-01		COLD VAPOR AA
			MN	1.37	%	MJF	18-JUN-01		ICP
			NI	<0.02	%	MJF	18-JUN-01		ICP
			PB	0.036	%	MJF	18-JUN-01		ICP
			SB	0.026	%	MJF	18-JUN-01		ICP
			SE	<0.02	%	MJF	18-JUN-01		ICP
			TL	<0.02	%	MJF	18-JUN-01		ICP
			V	<0.02	%	MJF	18-JUN-01		ICP
			ZN	1.63	%	MJF	18-JUN-01		ICP

ASARCO TECHNICAL SERVICES CENTER

ANALYTICAL DATA REPORT

East Helena

Technical Services (Project 3101)

Batch No: L010791

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	HOLD DAYS	METHOD
L010791-002	23-MAY-01	FUMED ASARCO SLAG (TCLP)	AG	<0.050	ppm	ESH	08-JUN-01		6010
			AS	<0.10	ppm	ESH	08-JUN-01		6010
			BA	1.4	ppm	ESH	08-JUN-01		6010
			BE	<0.005	ppm	ESH	08-JUN-01		6010
			CD	<0.050	ppm	ESH	08-JUN-01		6010
			CR	<0.10	ppm	ESH	08-JUN-01		6010
			HG	<0.50	ppb	MO	07-JUN-01		7470
			NI	<0.10	ppm	ESH	08-JUN-01		6010
			PB	0.23	ppm	ESH	08-JUN-01		6010
			PH	9.2	pH	MO	05-JUN-01		150.1
			SE	<0.10	ppm	ESH	08-JUN-01		6010
			TL	<0.10	ppm	ESH	08-JUN-01		6010
			V	<0.10	ppm	ESH	08-JUN-01		6010
			ZN	17	ppm	ESH	08-JUN-01		6010

Approved

Reviewer

APPENDIX C

EXAMPLE INSPECTION FORM

INTERIM CAP INSPECTION CHECKLIST

AREA INSPECTED	Area No.		Inspected by:	DATE:		
				ACTION NEEDED		
	ITEM NO.	CONDITION	OBSERVATION	MONITOR	INVESTIGATE	REPAIR
INTERIM LINER SYSTEMS	1	Exposed liner				
	2	Sand Bags				
	3	Liner Seams				
	4	Liner/Concrete Attachments				
	5	Site Drainage				
Additional Comments:						

APPENDIX D

STANDARD OPERATING PROCEDURES (SOP) FOR SURFACE SOIL AND SUB-SURFACE SOIL SAMPLE COLLECTION

STANDARD OPERATING PROCEDURE
DETERMINATION, IDENTIFICATION, AND DESCRIPTION OF
FIELD SAMPLING SITES©
HF-SOP-2

1.0 PURPOSE

This Standard Operating Procedure (SOP) is to be used for locating, identifying and describing field sampling sites. The objective of this SOP is to clearly identify the sampling site location and to describe the site in such a manner as to ensure accurate site relocation for repetitive sampling.

2.0 EQUIPMENT

- Accurate map or air photo with coordinate grid
- Global Positioning System (GPS) instrument
- Colored site marker (a steel fence post, rebar, wooden stake, etc.)
- Identification tag
- Camera and film
- Detailed map

3.0 PROCEDURE

Location of field sampling sites can be reported using the following:

- Latitude-Longitude - accurate to at least 0.2 minutes and preferably to less than 0.1 minutes

- General Land Office Coordinates - see **Figure 1** (System for Geographical Location of Features) for location procedure. Location should be at least to nearest quarter-quarter section.

- State or Project Coordinates - Many project sites have a plane coordinate grid and many states have a coordinate system. Location should be as accurate as possible.

- Narrative Description - In addition to a location by latitude-longitude, coordinates, or general land office designation or coordinates, a narrative description also is valuable. Some sampling sites are so close together that they cannot be separated except by a narrative description. Such locations should be referenced by distance and azimuth from some "permanent" fixtures (large rocks), trees, buildings, etc. Additionally, an air photo or ordinary color photograph (with the site clearly marked) is very helpful in locating sites.

All field sampling sites will be identified by placement of colored site markers such as a steel fence post, rebar, wooden stake, etc. The station designation and location will be noted on an identification tag that is securely fastened to the site marker. The station designation used will be determined by the Project Manager.

For each field sampling site established, an Identification and Description of Sampling Site form (**HF-FORM-407**) will be completed. All information requested on the form will be supplied. In addition, a photograph of the site with a full description of the "view" of the photo noted (e.g. "looking downstream from bedrock outcrop 50 feet upstream of site") will be attached or mounted on the form. The sampling site will be marked on the photo and on a detailed site map.

4.0 RELATED REFERENCES

HF-FORM-407 - Identification and Description of Field Sampling Sites

SYSTEM FOR GEOGRAPHICAL LOCATION OF FEATURES

Geographic features such as sampling sites, wells and springs are assigned a location number based on the system of land subdivision used by the U.S. Bureau of Land Management. The number consists of 10 to 16 characters and describes the location by township, range, section and position within the section. The figure below illustrates this numbering method. The first three or four characters of the number give the township, the next three or four the range. The next two numbers give the section number within the township and the next letters describe the location within the quarter section (160-acre tract) and quarter-quarter section (40-acre tract). If the location is known to sufficient accuracy then one or two additional letters can be used to describe the quarter-quarter-quarter-quarter section (2 1/2-acre tract). These subdivisions of the 640-acre section are designated as A, B, C and D in a counterclockwise direction beginning in the northeast quadrant. If there is more than one feature in a tract, consecutive digits beginning with the number 1 are added to the number. For example, if a sampling site was in Section 21, Township 29 North, Range 20 West, it would be numbered 29N20W21DAAD2. The letters DAAD indicate the well is in the southeast 1/4 of the northeast 1/4 of the northeast 1/4 of the southeast 1/4 and the number 2 following the letters DAAD indicates there is more than one site location in this 2 1/2-acre tract. If geographic features are located to the nearest 40 acre or 10 acre tract, the numbering methodology is the same except the last one or two letters are absent.

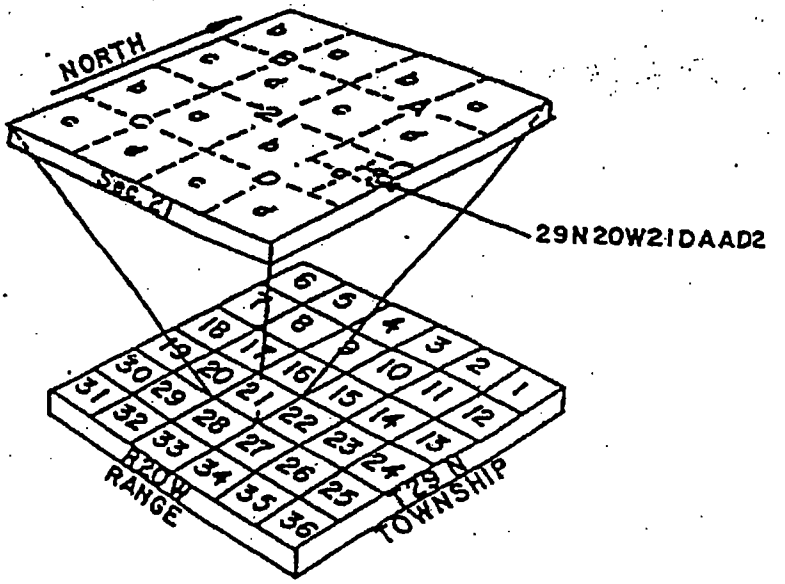


Figure 1. System for Geographical Location of Features

STANDARD OPERATING PROCEDURE FORM

IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES©

HF-FORM-407

PROJECT: _____ NUMBER: _____

SITE CODE: _____ HYDROMETRICS' UNIQUE SITE CODE: _____

NARRATIVE SITE DESCRIPTION: _____

_____

SITE LOCATION: T _____ N S R _____ E W SEC _____ TRACT _____

LATITUDE/LONGITUDE _____ N _____ E

COORDINATES: _____

COUNTY: _____ STATE: _____

STATION TYPE: Stream Spring Well Pond Process Water Soil
OTHER: _____

REMARKS (Access, etc.): _____

_____

_____

(ATTACH PHOTO HERE)

DESCRIPTION OF PHOTO "VIEW": _____

_____

_____

DATE: _____ INDIVIDUAL (Signature): _____

ATTACH MAP OF SAMPLING SITE TO THIS FORM

STANDARD OPERATING PROCEDURE

PACKING AND SHIPPING SAMPLES
HF-SOP-4

1.0 PURPOSE

This procedure is to be followed when packing and shipping water or soil samples to the laboratory by commercial carrier. The Chain-of-Custody standard operating procedure (**HF-SOP-5**) also must be followed if required in the project plan.

2.0 PROCEDURE

2.1 All samples must be labeled and labels filled out in waterproof ink. The label can be Hydrometrics' standard shipping label or may be a project-specific label. Sample labeling procedures are detailed in **HF-SOP-29** (Labeling and Documentation of Samples).

2.2 All samples are placed in the shipping container - normally a metal or plastic cooler.

2.3 Packing:

2.3.1 Sample containers are typically placed in a cooler. Other commercially available insulated containers may be used. The project manager should determine that the containers are appropriate to the type of sample being shipped.

2.3.2 If trip blanks are required, typical for organics sampling, be sure one is present for each and every shipping container.

2.3.3 If an ice pack is used, place the ice pack in the cooler or cooler lid as needed. Fill space with bubble mat wrap or packing material. If necessary, place bubble wrap on top of samples. Sufficient packing material should be used to prevent sample containers from contacting each other during transport.

2.3.4 If custody seals are required, they will be placed on at least two places connecting the cooler container lid to the cooler.

2.3.5 Coolers are then wrapped with nylon strapping tape. Two full rotations of tape will be placed at least two places on the cooler.

2.4 Packing and shipping procedures for Superfund facilities should follow guidelines outlined in the EPA document "A Compendium of Superfund Field Operating Methods".

3.0 SHIPPING

Samples can be sent by commercial air carrier, overnight express, Federal Express or other means. The allowable holding time and often the ability to keep samples cold are important considerations. Copies of all shipment records must be kept in the project files.

Each sample container will be marked with:

- Sampling organization name, address and telephone number;
- Laboratory name, address and telephone number; and
- Ship samples via courier following any applicable DOT requirements. The project manager should determine if there are any special shipping considerations.

3.1 Documents

Each shipping container will contain a description of samples enclosed, date of collection and date of shipment, either a cover letter or a Request for Analytical Services, and/or a Chain-of-Custody form. See Labeling and Documentation of Samples **(HF-SOP-29)**.

For Chain-of-Custody shipments complete a Chain-of-Custody form (see Chain-of-Custody Standard Operating Procedure **HF-SOP-5**).

- Sign the form.
- Place two copies in zip-lock bag in sample container.
- Keep one signed copy in project file.

Signing of the Chain-of-Custody form (record) relinquishes custody of the samples. Relinquishing custody should only occur when directly shipping to the analytical laboratory.

4.0 RELATED REFERENCES

HF-SOP-5 Chain-of Custody Procedure

HF-SOP-29 Labeling and Documentation of Samples

U.S. EPA, 1982. Handbook for Sampling and Sample Preservation of Water and Wastewater. EPA-600/4-82-029.

U.S. EPA, 1987. A Compendium of Superfund Field Operations Methods PB88-181557.

STANDARD OPERATING PROCEDURE

CHAIN-OF CUSTODY
HF-SOP-5

1.0 PURPOSE

The purpose of this procedure is to maintain a chain-of-custody for samples. All soil and water samples collected and sent to the laboratory for analysis will be documented using standard chain-of-custody procedures.

2.0 CUSTODY PROCEDURE

Samples will be collected at established project sampling sites using Standard Operating Procedures (SOP). Sampling activities will be recorded in the samplers daily log book and the appropriate collection form(s) completed (see appropriate sampling SOP). Each sample container will be identified by labeling. Labels are attached to sample bottles and are protected with clear label tape to prevent abrasion of labeling information and to guard against failure of label adhesive.

2.1 Sample Identification

Each sample bottle should be labeled with the following information:

- Site;
- Sample Number;
- Person taking the sample;
- Date and time of collection;
- Sample matrix (water, soil, oil, etc.);
- Basis (total or dissolved);
- Preservation; and
- Analyses to be performed.

Labels will be written in waterproof ink.

Use of pre-printed, self-adhesive labels, if available, is preferred.

All samples must be traceable from the time the samples are collected until they are received by the analytical laboratory. The laboratory is then responsible for custody during processing and analysis.

A sample is under custody if:

- It is in your possession;
- It is in your view, after being in your possession;
- It was in your possession and then you locked it up to prevent tampering; or
- It was in your possession and then you placed it in a designated secure area.

2.2 Custody Records

Each sample is identified on a Chain-of-Custody Form(s) (**HF-FORM-001**) by its sample number, date and time of collection, and analysis requested.

Documents will consist of:

- Sample collection records;
- Chain-of-Custody form(s) (**HF-FORM-001**);
- Analytical Parameter List(s) **including analytical methods and detection limits** if not on the Chain-of-Custody form;
- Shipping receipt(s); and
- Purchase Order(s).

3.0 CUSTODY TRANSFER AND SHIPMENT

All samples will be accompanied by **Chain - of - Custody** record (**HF-FORM-001**). The following procedures will be followed:

- When transferring the possession of samples, the individual(s) relinquishing and receiving will sign, date and note the time on the record. This record documents sample custody transfer from the sampler to the laboratory.

- Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The method of shipment, courier name(s) and other pertinent information are entered in the "Remarks" box.

- All shipments will be accompanied by the **Chain - of - Custody Record (HF-FORM-001)** identifying its contents. The original record will accompany the shipment and a copy will be retained in the project file.

- Analytical parameters requested must be noted on the Chain-of-Custody Record, or an attached analytical parameters list accompanying the Chain-of-Custody Record. If not attached to the Chain-of-Custody, an Analytical Parameter List **including analytical methods and detection limits** must be included with each shipment and should specify methods of analysis required for each parameter.

- All shipping receipts (next day air waybills, freight bills, post office receipts, bills of lading, etc.) purchase orders, and sample collection records will be retained in the project file.

4.0 CUSTODY SEALS

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals. A typical custody seal is shown in **Figure 1**. Some custody seals are serially numbered. Other custody seals are unnumbered seals or evidence tape.

Two seals must be placed on each shipping container (cooler), one at the front and one at the back as shown in **Figure 1**. Clear tape should be placed over seals to ensure that seals are not accidentally broken during shipment.

5.0 RELATED REFERENCES

HF-FORM-001 - Chain-of-Custody Record (3-part NCR form)

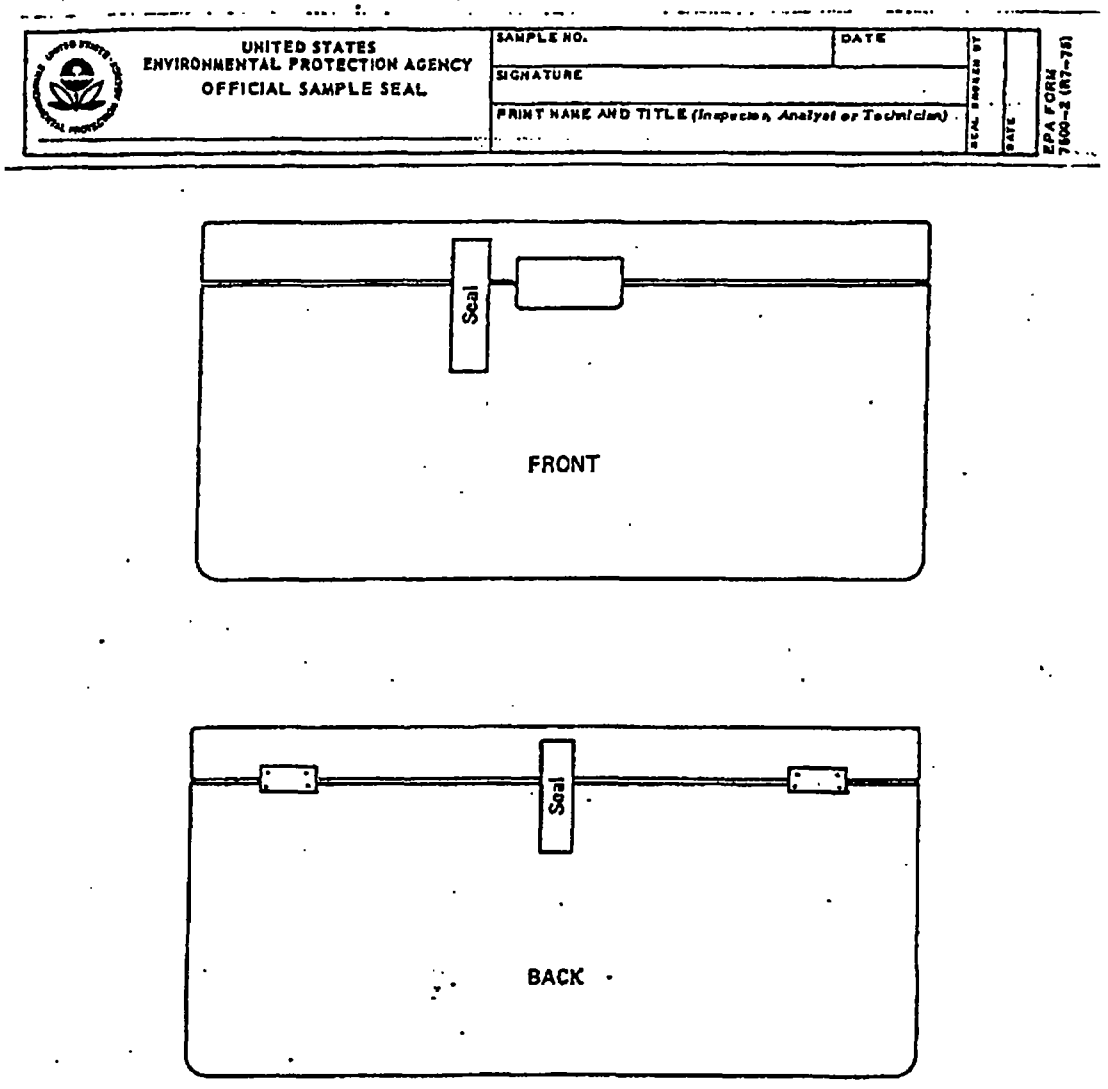


Figure 1. Proper Placement of Custody Seals

Hydrometrics, Inc.

3020 Bozeman Avenue - Helena, Montana 59601 - (406)443-4150

CHAIN OF CUSTODY RECORD

PROJ. NO	PROJECT NAME	NO. OF. CON-TAINERS											Remarks
SAMPLERS: (*Signature*)													
DATE	STA #	TIME	COMP	GRAB	SAMPLE NUMBER								

Relinquished (*Signature*)	Date/Time	Received by: (*Signature*)	Lab	Shipped via: Bus, Fed Ex, UPS or Other_____ Air Bill #_____
Relinquished (*Signature*)	Date/Time	Received by: (*Signature*)	Remarks	
Relinquished (*Signature*)	Date/Time	Received for Laboratory by: (*Signature*)	Date/Time	Enclo ☐ Parameter list wth DTLs ☐ Cover Letter

Split Samples:
[ ]Accepted [ ]Declined_____
Signature

Return results & electronic copy to:
QA/QC Department at address at top of page

HFORM-1-10/98
h:\admin\hsop\sec 6.0\hf-001.xls

STANDARD OPERATING PROCEDURE

DECONTAMINATION OF SAMPLING EQUIPMENT
HF-SOP-7

1.0 PURPOSE

Unless entirely disposable sampling equipment is used, cross-contamination can occur and sampling equipment must be decontaminated between sampling locations. The following are examples of equipment that may require decontamination:

1. Water level probe;
2. Reusable bailers used to obtain samples from wells;
3. Containers used to composite or contain samples;
4. Soil piston sampler;
5. Water filter apparatus (0.45 micron);
6. Soil coring devices; and
7. Drilling rig and/or backhoe.

This list is not exhaustive and field personnel should review sampling plans prior to implementation, and plan decontamination procedures in accordance with the type of work to be conducted and the equipment to be used.

2.0 EQUIPMENT

One or more of the items below is required. Check procedures that follow.

Tap water	Gloves (latex or nitrile)	
Non-phosphate detergent	Distilled or Deionized (DI) Water	Buckets
High Pressure Washer	Organic solvent (preferably hexane or methanol), certified ACS Grade or better	Brushes

3.0 PROCEDURES

Effective decontamination of sampling equipment for sampling inorganics can be achieved by using the following three step process:

1. Wash equipment in warm water and detergent, scrubbing with brushes as necessary to remove visible contaminants;

2. Rinse equipment thoroughly with clean tap water; and

3. Rinse equipment thoroughly with DI (deionized) water.

When sampling for various organic parameters which leave heavy residues on sampling equipment, decontamination may require additional steps:

4. Solvent rinse (preferably hexane or methanol, certified ACS Grade or better); and

5. DI water rinse.

Deionized or distilled water used during sampling equipment decontamination should be obtained from a source with documented capability to produce contaminant-free water. The source of DI water used (both production source and individual carboy) and any available measurements such as specific conductivity should be recorded in the field notebook. At least 50 mL of DI water should be run through the DI carboy spout prior to using DI water for decontamination or blank sample purposes.

Specific decontamination procedures used should be recorded in field notebooks. Special procedures (i.e., dilute acid rinses, alternate solvent rinses) may be required for some projects. Any departures from the basic protocol given above for inorganics or organics should also be noted.

The subsections below suggest specific procedures relevant to equipment which may require frequent decontamination.

3.1 WATER LEVEL PROBES

The water level probe should generally be decontaminated between measurements by rinsing thoroughly with DI or distilled water. If groundwater is known to be contaminated with inorganic or organic constituents, however, additional rinses with soap and water or organic solvent may be required.

3.2 BAILERS

Reusable bailers normally will be stainless steel, teflon or PVC plastic **(NOTE: PVC is not to be used when organics are of concern)**. A bailer can be used exclusively on one monitoring well (dedicated bailer) or used at multiple wells.

If dedicated bailers are used, they will be rinsed with tap water, then rinsed with DI water. The bailers then will be stored in capped PVC containers in Hydrometrics' storage area.

Bailers that are used in more than one well will be decontaminated by rinsing between wells. All bailers will be rinsed a minimum of three times with the water to be sampled before the sample is taken.

Disposable polypropylene twine will be used for bailing with new twine used for each well.

3.3 CONTAINERS

Containers may be used to composite or hold water or soil samples. Between samples, these containers must be decontaminated. Water sample containers also should be rinsed a minimum of three times with water to be sampled.

3.4 SOIL PISTON SAMPLER

The soil piston sampler will be decontaminated between sample sites by washing in warm water and detergent followed by rinses in tap water and DI water.

3.5 WATER FILTER

Most filtered water samples are processed through disposable cartridge filters using a peristaltic pump and disposable silicone tubing. However, if a reusable pressure water filter apparatus is used to filter water samples through flat 0.45 micron membranes, the filter apparatus must be decontaminated after each use with soap and water, tap water, and DI water as necessary. The filter apparatus should then be rinsed three times with the water to be sampled prior to taking the sample. Additionally, a volume of sample water is flushed through the new filter before the actual sample is taken (see **HF-SOP-73, Filtration of Water Samples).**

3.6 SOIL CORING DEVICES

Soil samples may be obtained from drill holes by use of coring devices. Split spoons or Shelby tubes can be used. These devices will be decontaminated by thoroughly washing between each sampling depth and sampling sites. Washing will include warm water and detergent followed by a rinse with tap water and DI water.

3.7 DRILLING RIG

Cross-contamination may occur from the drilling rig. The drilling rods and drilling bits will be washed with tap water between holes and, if necessary, they will be washed with warm water and detergent to remove all dirt or other potentially contaminated material.

If necessary, a pressurized washer (hot or cold water as appropriate) should be used. The detergent wash should be followed by a tap water rinse. This procedure is applicable for both **ORGANIC** and **INORGANIC** samples.

3.8 BACKHOE

Cross-contamination may occur from the backhoe. Therefore, the bucket and boom shall be washed with a pressurized washer capable of producing at least 1500 psi at a temperature of

120°F. The backhoe shall be washed with detergent water and then rinsed with municipal tap water. This procedure is applicable for both **ORGANIC** and **INORGANIC** samples.

4.0 RINSATE BLANK COLLECTION

Equipment used in collection of water samples often requires testing to assure that decontamination procedures are effective. This will be accomplished by rinsing of the decontaminated equipment with deionized water and measurement of the concentration of parameters of interest in this "blank sample". Sufficient blanks will be collected to ensure there is no cross-contamination caused by the sampling device. Details of rinsate blank collection procedures are contained in **HS-SOP-13, Rinsate Blank Collection.** Typically, blank collection and analysis procedures are also specified in the project work plan.

5.0 ASSOCIATED REFERENCES

HF-SOP-73 **Filtration of Water Samples**

HS-SOP-13 **Rinsate Blank Collection**

STANDARD OPERATING PROCEDURE

LABELING AND DOCUMENTATION OF SAMPLES
HF-SOP-29

1.0 PURPOSE

Documentation of all samples is an important aspect of the project quality assurance program. This SOP specifically describes sample labeling procedure, but also addresses related aspects of sample documentation, all or some of which may be required by the project Quality Assurance Project Plan (QAPP).

2.0 EQUIPMENT

Sample documentation will involve use of some or all of the following:

1. Sample Identification Tag or Labels;
2. Chain-of-Custody Records;
3. Custody Seals;
4. Sample Analysis Form, or cover letter and parameter list; and
5. Field Notebooks.

These documents are sequentially numbered or sequentially paged.

All forms are completed using waterproof ink. Where necessary, the sample labels are protected with label protection tape.

3.0 SAMPLE IDENTIFICATION TAGS OR LABELS

Projects which may be the subject of litigation or are mandated by the EPA typically require serially numbered Sample Identification Tags. Sample labels (generally self-adhesive) are used in lieu of Sample Identification Tags for many projects and provide the same information, but are not serially numbered. The following discussion pertains specifically to use of Sample Identification Tags but, except for the next two paragraphs, is applicable to sample labeling in general.

Sample Identification Tags are distributed to field investigators and the serial numbers are recorded in project files and the field notebook. Individuals are accountable for each tag assigned to them. A tag is considered in their possession until it has been filled out, attached to

a sample and transferred to another individual with the corresponding Chain-of-Custody Record.

At no time are any Sample Identification Tags to be discarded. If any tags are lost, voided or damaged, the circumstances are noted in the appropriate field notebook immediately upon discovery and the Quality Assurance officer notified. At the completion of the field investigation activities, all unused Sample Identification Tags are returned and are checked against the list of assigned serial numbers.

Samples are removed from the sample location and transferred to a laboratory or other location for analysis. Before removal, however, a sample is often separated into fractions depending on the analysis to be performed. Each portion is preserved in accordance with prescribed procedures and each is identified with a separate Sample Identification Tag. In this case, each tag should indicate in the "Remarks" section that it is a split sample.

The information recorded on the tag or label includes:

- **Project Code**. An assigned Hydrometrics number (optional);
- **Station Number**. A code assigned by the Field Team Leader (optional), which identifies the station location;
- **Date**. A six-digit number indicating the year, month and day of collection;
- **Time**. A four-digit number indicating the 24-hour clock time of collection (for example, 1345 for 1:45 p.m.);
- **Sample Number**. The sample code number assigned to that sample and recorded in the field notebook;
- **Samplers**. Each sampler's name;
- **Preservative**. The tag should indicate whether a preservative is used, the type of preservative, and whether the sample has been field filtered;
- **Analysis**. The general type of analysis requested;
- **Tag Number**. A unique serial number, stamped on each tag (optional); and
- **Remarks**. The sampler's record of pertinent information (sample matrix, dissolved vs. total, highly contaminated, etc.).

The tag used for water, soil, and sediment samples contain an appropriate place for designating the sample as a grab or a composite, identifying the type of sample collected for analysis, and

indicating preservation, if any. The Sample Identification Tags are attached to or folded around each sample and are taped in place.

After collection, separation, identification and preservation, the sample is handled using chain-of-custody procedures as discussed in the **Chain-of-Custody Standard Operating Procedure (HF-SOP-5).**

If the composite or grab sample is to be split, aliquoted portions are placed into similar sample containers. Sample Identification Tags are completed and attached to each container. Tags on quality control samples (e.g. blank, duplicate, blind field standards) are NOT marked to identify samples as such.

3.1 SAMPLE CODE NUMBERING OF DUPLICATE SAMPLES FOR XRF ANALYSES

When collecting duplicate soil samples to be analyzed by XRF techniques, the duplicate sample number is the same as the original sample number with the exception of a suffix "D" designation.

For example:	XYZ-9710-100	Original Sample Number
	XYZ-9710-100D	Duplicate Sample Number

4.0 CHAIN-OF-CUSTODY

Samples collected during any investigation may be used as evidence and their possession must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To document sample possession, Chain-of-Custody procedures are followed. These procedures are described in the **Chain-of-Custody Standard Operating Procedure (HF-SOP-5).**

5.0 SAMPLE SHIPMENT

Samples are packaged properly for shipment as described in the **Packing and Shipping Samples Standard Operating Procedure (HF-SOP-4)** and dispatched to the appropriate laboratory for analysis.

If sent by mail, the package is registered with return receipt requested. If sent by overnight express courier or common carrier, a Bill of Lading is used. Air freight shipments are sent collect. Freight bills, Postal Service receipts and Bills of Lading are retained as part of the permanent documentation.

When Chain-of-Custody is required, a separate custody record must accompany each shipment. When transferring samples, the individuals relinquishing and receiving samples will sign, date

and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst at the laboratory.

6.0 SAMPLE ANALYSIS REQUEST

Samples sent to a laboratory for testing will be accompanied by a Request for Analytical Services or cover letter that describe the samples, specifies the testing required, and who is to receive the analytical report. Commonly, a standard analytical schedule is used for a project and this schedule should be attached to the Request for Analytical Services or cover letter.

7.0 FIELD NOTEBOOKS

A bound field notebook must be maintained by the Field Team Leader to provide a daily record of significant events, observations and measurements during field investigations. All entries should be signed and dated. All members of the field investigation should use this notebook. It should be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence.

8.0 CORRECTIONS TO DOCUMENTATION

Unless prohibited by weather conditions, all original data should be recorded in field notebooks, Sample Identification Tags and Chain-of-Custody Records are written with waterproof ink. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one individual, that individual may make corrections simply by crossing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

9.0 SAMPLE NUMBERING

All samples of water and earth materials will be assigned a number by Hydrometrics. The numbers assigned for water samples will all use the project prefix and will be followed by a sequential number. The first sequential number will be 1 and a total of 5000 numbers are available for project water samples. A water sample may consist of several bottles if the sample is to be analyzed for several parameters, each requiring a different preservation technique. All

bottles for a sample will have the same sample number. Sampling data including site identification and sample numbers will be recorded in the field sampler's notebook to allow positive identification of the sample.

All samples of earth materials such as drilling cores from test wells and stream bottom sediment will be assigned a number by Hydrometrics. The numbers assigned for earth material samples will use the project prefix and will be followed by a sequential number. The first sequential number will be 5001 and a total of 4999 numbers are available for these samples. Sampling data and sample numbers for earth materials will be recorded and handled in the same manner as for water samples.

The laboratory will not be aware of the specific sample source. All quality control samples will use the same sample numbering method.

10.0 ASSOCIATED REFERENCES

National Water Well Association, 1986. RCRA Groundwater Monitoring Technical Enforcement Document. September.

U.S. EPA, 1986. Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, Vol. II: Field Manual Physical/Chemical Methods. November.

STANDARD OPERATING PROCEDURE

FIELD NOTEBOOKS
HF-SOP-31

1.0 PURPOSE

Field notebooks are intended to provide sufficient data and observations to enable project participants to reconstruct events that occurred during the project and to refresh the memories of field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence.

2.0 EQUIPMENT

Bound notebook with water resistant pages Pen with indelible ink

3.0 PROCEDURE

A bound field notebook must be maintained by the Field Team Leader to provide a daily record of significant events, observations and measurements during field investigations. All members of the field investigation should use this notebook and initial their entries. It should be kept as a permanent record. All information called for in the Work Plan must be recorded, and any other data pertinent to the investigation at hand.

General information recorded in the field notebooks **must** include:

- Date and time;
- Weather conditions;
- Site name and description (if the first visit);
- Names of individuals participating in and/or observing sampling; and
- Unusual circumstances (unlocked well lid, missing staff gage, flood stage, etc.).

In addition, sampling personnel must record descriptions of sampling activities and parameters determined at each sampling station, appropriate to the type of media being sampled. This should include (but is not limited to) the following:

1) For water sampling (surface water and/or groundwater):

Water level measurement
Flow measurement
Sample collection:
- Site number
- Sample code number
- Date and time
- Bottle size(s)
- Sample tag number (for Superfund investigations)
- Bottle quality control number (for Superfund)

Dissolved Oxygen
Water Temperature
Specific conductivity
Calibration of Field Equipment

Preservative(s)
pH
Filtration

2) For soil sampling and/or sediment sampling:

Soil moisture conditions
Soil type (textural classification)
Sample collection

- Site number
- Sample code number
- Date and time
- Sample tag number (for Superfund investigations)

Sketch map of property, designated sample units and sample locations (for soil samples), or cross-section of stream sampled and approximate grab sample locations (for sediment samples).

Site descriptions should be adequate for someone unfamiliar with the site to relocate sampling point, and should be particularly detailed if this is the first sampling.

Other information deemed pertinent to sampling procedures and field conditions should be entered in field notebooks. This should include (at a minimum):

1. Notes confirming that calibration of field instruments (pH, SC, DO, etc.) was performed prior to sampling;

2. Notes detailing decontamination procedures performed (methods, any reagents used);

3. Notes describing the source of DI water used for decontamination or for collection of blanks; and

4. Notes describing shipment of samples to the laboratory and any enclosures included as part of such shipments (chain-of-custody, parameter lists, etc.).

All field notes should be entered into bound notebooks with indelible ink. Corrections should be made by deleting incorrect information with a single line and initialing the deletion in the field notebook. Each page should be numbered consecutively and signed by field personnel. All field records should be kept under custody of the Field Team Leader. Copies of the field records should be available for distribution to all team members for data reduction and report preparation.

STANDARD OPERATING PROCEDURE

MANAGEMENT AND VALIDATION OF FIELD AND LABORATORY DATA©

HF-SOP-58

1.0 INTRODUCTION

This is a summary of procedures for data quality control at Hydrometrics. This plan contains the standard routines that have been established for management and validation of all field and laboratory data. The purpose of this plan is to:

- Summarize procedures used in the collection, input, and validation of data;
- Establish personnel responsibilities for each step in the process; and
- Describe documentation of this process and use of standard forms.

This process has been developed by Hydrometrics' Data Quality Department and deviations from this process must be approved by this department.

2.0 PROJECT SAMPLING, ANALYTICAL, AND QUALITY ASSURANCE PLANS

Collection of good quality data begins with good sampling and analytical plans (SAPs) and quality assurance program plans (QAPPs). Data does not become better with use, with validation, or with graphical presentation. Therefore, the greatest burden of responsibility for the quality of data is on the manager of each project and prior to sample collection and analysis. Preparers of SAPs and QAPPs are encouraged to seek assistance in preparation of SAPs and QAPPs from Data Quality Department personnel. They can advise you as to quality criteria and avoid inconsistencies in specifications that can make data validation troublesome, unnecessarily time consuming, and possibly meaningless. Copies of all SAPs and QAPPs must be submitted to the **Data Quality Department** to aid in the validation of data. Many potentially severe problems in data handling can be avoided by coordination with **Data Quality Department** personnel.

3.0 DATA FLOW AND DOCUMENTATION

Data flow in the management and validation process is summarized as follows:

1) Initiate Sampling Event

Project Manager or Field Supervisor initiates sampling events by submitting a Monitoring Description Form **(HF-FORM-449)** to the **Data Quality Department.**

The purpose of this form is to provide:

- A list of sites to be monitored (site code list) including information on any new sites;
- A description of the types and numbers of quality control samples to be submitted; and
- The analytical schedule (parameter list) for field and laboratory analyses.

These forms are kept on file in the **Data Quality Department's** sample event files (SEF) for ready reference.

2) Generate Sample Code List and Start Sampling Event File

Sample codes are needed for all sites where data is to be collected regardless of whether a water quality sample is collected (e.g., a surface water site where only flow is measured). The **Data Quality Department** will generate a sample code list which lists sample codes, site codes, and site descriptions for all planned monitoring sites. A set of extra sample code numbers to be used for additional unplanned samples or field data also will be developed. At this time, the **Data Quality Department** will also start a Sampling Event File in which all information and forms regarding the monitoring event will be filed.

3) Collect and Record Monitoring Data

All pertinent field data will be recorded on sampling forms. Data is originally recorded in a field notebook and data will be transcribed onto the sampling forms **(Identification and Description of Field Sampling Sites -- HF-FORM-407)** by field technicians. Sampling forms must be filled out completely. If data is not collected, an explanation must be given (e.g., stream was dry, staff gage is missing, Township and Range not known, etc.).

4) Shipment of Samples

All samples submitted to labs must be accompanied with:

- Chain-of-custody documentation (**HF-FORM-1**);
- Analytical parameter list; and
- Letter of transmittal to the laboratory.

ALL labs for **ALL** projects will receive a work plan (even in memo or letter form); or a QAPP.

An example transmittal letter is attached. **Transmittal letters must specify that analytical results are to be sent to the Data Quality Department.**

5) **Submit Field Data and Completed Sampling Forms**

Upon returning from the field, the **Field Technician** will submit a Data Quality Completion Form **(HF-FORM-450)** with the following data and forms to the **Data Quality Department**:

- Sample code list (revised to include any deviations from scheduled monitoring);
- Copy of field notes;
- Field forms;
- Copy of chain-of-custody documentation;
- Analytical parameter list;
- Copy of true values of standards and/or spikes used for QC purposes; and
- Letter of transmittal to the laboratory.

Information on new monitoring sites (name of site, site code, and type of site) must be approved by the **Project Manager** prior to input into the database system and any new sites must be described on the Monitoring Description Form **(HF-FORM-449)**.

Samplers will give copies of **all** field data, including field notebooks, flow forms, sampling forms, and sample code lists, to the **Data Quality Department** for entry into the database. All computer-calculated flows will be performed by the **Data Quality Department.** To provide an additional check on the accuracy of computer-calculated streamflows, field technicians should also calculate flow data.

6) **Input and Validation of Laboratory Data**

The **Data Quality Department** will receive **all** laboratory data. When lab data has returned to Hydrometrics, the Project Manager will be notified by the department.

Laboratory data will be input and visually validated within a one week period. A memo explaining the findings of the validation, recommendations for laboratory retests, and an attached copy of the computer printout of the analysis will be given to the **Project Manager** or his designated representative. If laboratory retests or further validation are required, the **Project Manager** must request them from the **Data Quality Department**.

Please, do not contact laboratories directly! The Data Quality Department tracks data and retests from the labs. If you have a question about the status of data, ask Data Quality personnel to investigate for you.

7) **Field Technician Debriefing and Data Review**

The **Project Manager** and **Field Technician** should meet to discuss the monitoring results, performance on field quality control, the adequacy of the data, and any possible changes for future monitoring.

8) **Closing and Storage of Sampling Event File**

Upon receipt of all relevant documentation and approval of data validation by the **Project Manager** and **Field Technician**, the sampling event file will be labeled as "validated" and stored in the **Data Quality Department's** filing system.

9) **Summary Memo to Client and Administration File**

It is recommended, although not required, that the **Project Manager** provide the client with a memo summarizing results of the monitoring event. The memo should include:

- A description of the monitoring conducted;
- A draft copy of the validated data;
- A description of any anomalous data and laboratory retest results; and
- Any suggested changes for future monitoring.

The purposes of this memo are to keep the client updated on monitoring results and to notify the client contact concerning any important information about the sampling event. Therefore, summary memos should be customized for each client and also could include additional items such as hydrographs, photographs, graphs of water quality parameters vs time, etc. Copies of summary memos should be submitted to the sampling event file.

4.0 ELEMENTS OF DATA QUALITY PLAN

1) Monitoring Description Form (HF-FORM-449)

This form is to be used by the **Project Manager** or **Field Supervisor** to initiate a sampling event. The form provides information regarding what sites are to be sampled, what samples are to be collected and analyzed, and other information regarding the sampling event.

2) Data Quality Completion Form (HF-FORM-450)

This form is to be completed by the person requesting work to be done. It will be attached to the sampling information when it is submitted by field personnel. It will then remain in the sample event file so the progress of a sampling event can be quickly checked. The Data Quality Completion Form should be initialed immediately upon the completion of each step.

3) Sample Code List

The sample code list is a list assigned by the **Data Quality Department** before a sampling event. This list contains a sample number for each site which is to be sampled or observed. There will also be a description of each site.

4) Site Codes

Site codes will designate an actual physical location only. Matrix type will be specified in the sample number. For example, all samples collected from Monitoring Well number 1 (MW-1) will have MW-1 as their site code, whether they are soil samples, water samples, or other types of samples. When soil samples are taken from multiple depth intervals at the same site, each will be given an integer suffix which corresponds to the depth interval.

This will simplify identification of site names on maps and facilitate comparison of all types of sampling at a given site. Assignment of site codes to sampling sites is the responsibility of the **Project Manager**. This information must be provided to the **Data Quality Department.**

5) Sampling Event File

Laboratory and field data will be filed by sampling event. The **Data Quality Department** will begin a sampling event file for each new sample code list they generate. Each file will contain the following:

- Copy of the completed sample code list;
- Data quality completion form;
- Chain-of-custody forms;
- Letter of transmittal to the lab;
- Validation checklist;
- Any memos regarding the sampling event;
- All field notes and field data;
- Laboratory results; and
- Retest results.

All client files should have an information file set up which will contain the following:

- A copy of the original Work Plan and any revised Work Plans;
- Site maps with a list of site descriptions; and
- Special instructions for working with the data and any pertinent information that may apply to the data.

It is the responsibility of the **Project Manager** to make sure a copy of the three items above are received by the **Data Quality Department** as soon as they are made available.

All sample event files are in bright yellow jackets. Information files are in purple jackets, the validation file is teal and red files signify data that is for in-house use only and has not been input to the database. All files are stored in the file cabinets in the **Data Quality Department.**

6) Special Data Files

Data which is not typically entered into the water quality database will continue to be filed in the Project Files (main file cabinets). Special data includes pump testing data, infiltration data, survey data, etc. Each **Project Manager** is responsible for maintaining special data files as needed for individual projects.

The exception to this is a special sampling event that may be pertinent but the **Project Manager** has indicated the data should not be entered into the database. This data is stored in a red jacket file in the computer files. However, the practice of maintaining "special" files is discouraged. Because the data is not entered, it is not possible to conduct the normal validation steps and bad data may not be discovered in time to be retested (sample holding times are 6 months or less). Because the data does not show up in the database, experience has shown that the data will eventually become effectively lost or forgotten. Therefore, if data must be withheld from the database, it will be necessary for the Project Manager to provide a brief memo describing the data.

7) Data Validation Options and Checklists

There are three levels of data validation available:

Visual Validation: (HF-FORM-452)

This means data (lab and field) is checked for correctness of parameters, dates, site codes, site types, measurement basis, and units of measurement. Data values are compared with previous data for the site. Data will be printed out and returned to the **Project Manager** with a report indicating that a visual validation has been done and if anything out of the ordinary was found. This level is done for all projects.

Standard Validation: (HF-FORM-453)

All of the above visual validation is done plus the following: ion balance and statistical analysis are run, a check for completeness of field procedures, a check of quality control of field procedures, and data is flagged for exceedance of quality control limits. Data will be printed out and returned to the **Project Manager** with a validation report indicating acceptability of data.

EPA Validation: (HF-FORM-454)

This level of validation is time consuming and expensive and is typically only done for Superfund or RCRA projects. This validation includes the visual and standard validation procedures plus a check of frequency, precision, accuracy and completeness of all field and laboratory quality control procedures. The lab data is also flagged for exceedance in accordance with EPA Codes. Data will be printed out and returned to the **Project Manager** with a validation summary indicating acceptability of data per EPA Standards.

Validation procedures are documented through validation checklists. As each step in visual validation is done, the validation item is checked off and initialed. The validation checklist is provided to the **Project Manager** with a printout of the sampling results and a memo indicating any data problems. A copy of the checklist and memo will be filed

in the sample session file. This same procedure is used for Standard and EPA validations as well but, instead of a memo, a more detailed report and statistical summaries will be provided.

5.0 INDIVIDUAL RESPONSIBILITIES

The following are responsibilities required from the different personnel involved in monitoring and data quality at Hydrometrics:

Project Managers

Keep **Data Quality Department** personnel informed of upcoming sampling events, new projects, type of validation needed (a visual will always be done), changes in existing projects (e.g. changes in detection limits etc.) and deadlines for reports that will need any information from the Data Quality staff. Provide Work Plans, QAPPs, SAPs, and information on monitoring new sites to the **Data Quality Department** as soon as available.

The **Project Manager** will determine which field personnel will be Field Supervisor if the **Project Manager** is not available to head up the project.

Fill out the "Data Quality Completion" Form **(HF-FORM-450)** for the generation of sample code numbers and information pertaining to sample collection. Return to the **Data Quality Department** as soon as possible (at least 5 days prior to sampling if possible).

Meet with the field technician, go over the request form and give sample code numbers to field technician before sampling session.

Field Technicians

Meet with the **Project Manager or Field Supervisor** to get information and sample code numbers prior to sampling event.

Fill out the "Data Quality Completion" form **(HF-FORM-450)**, attach it to the sampling information and give it to the Data Quality Department within 5 days of returning to the office. Make sure to indicate on the cover letter to the lab or Chain-of-Custody that analysis is to be returned to the **Data Quality Department.**

Data Quality Department

When the lab analyses arrive at Hydrometrics, the project manager or other designated project staff will be notified that the data has been received by the **Data Quality Department.**

All data will be input and visually validated within a one week period (field and lab data arrive separately so each will receive a one week input time). The exceptions are large sampling packages and CLP packages which take a longer period of time.

- If more extensive validation is required, it will be done and a copy of the data set and a memo of the findings will be given to the project manager; and
- A file will be created and all data will be filed in the **Data Quality Departments'** filing system. The final data report will be attached to the "pink" signed validation report and filed in a teal jacket.

6.0 ASSOCIATED REFERENCES

HF-FORM-407 IDENTIFICATION AND DESCRIPTION OF FIELD SAMPLING SITES

HF-FORM-449 MONITORING DESCRIPTION FORM

HF-FORM-450 DATA QUALITY COMPLETION FORM

HF-FORM-452 VISUAL VALIDATION CHECKLIST FORM

HF-FORM-453 STANDARD VALIDATION CHECKLIST FORM

HF-FORM-454 EPA VALIDATION CHECKLIST FORM

Laboratory Transmittal letter

STANDARD OPERATING PROCEDURE

PROCEDURE FOR COLLECTING SURFACE SOIL SAMPLES©

HS-SOP-6

1.0 PURPOSE

This SOP describes the procedure for collecting a surface soil sample from the top 1 to 2 inches for subsequent chemical analysis.

Soil types and soil characteristics can vary considerable within and between sampling sites. It is important, therefore, that detailed records be taken; particularly of the sampling location, depth, and soil characteristics such as grain size and color. While this SOP describes a general procedure for collection surface soil samples, because of soil heterogeneity issues, modifications to this procedure may be appropriate depending on site-specific conditions and data collection objectives. Therefore, the project specific sampling and analysis plan should be consulted for any deviations to the procedure described below.

2.0 EQUIPMENT

- Stainless steel spoon or plastic spoon;
- Wide mouth glass jar (organics);
- 1 gallon size Zip-lock plastic bags (metals);
- Surgical gloves;
- Measuring tape; and
- Field notebook.

When sampling for metals, a stainless steel or plastic spoon should be used for collecting the sample. Sampling tools which are plated with chrome or other materials are to be avoided.

3.0 PROCEDURE

1. Locate the site to be sampled and record the site name and location in the field notebook (**HF-SOP-31**). The notes and drawings should outline the property boundary, location of sample units and sample sites, sample site names, sample depths and sample numbers, as appropriate.

2. An approximate 1x1 foot area should be delineated with the sample collected from the top 1 to 2 inches of soil within this area. A stainless steel or plastic spoon should be used to collect the sample. Generally, between 100 and 500

grams of soil is required. If more sample is required the sampling area should be expanded without increasing the depth of sampling.

3. If a sod layer is present, sod should be removed or folded back prior to sampling. Sod should not be included om the surface soil sample unless specifically required by the work plan. In this case, refer to HS-SOP-12, Procedure for Sampling Sod.

4. For grab samples, soil collected using a stainless steel or plastic spoon (at the surface or at depth) should be placed directly into the sample container. For metals samples a plastic zip-lock bag is an appropriate container. For organic samples, a glass container is required unless otherwise specified. Generally, coarse material should be excluded from the sample (greater than approximately 1/4 inch where feasible).

5. For composite samples or field split samples, the soil grab sample should be transferred from the stainless steel or plastic spoon to a stainless steel mixing bowl, Teflon tray, or similar device free of potential sample contaminants. Once all grab samples are collected, the sample should be thoroughly mixed prior to transferring the sample to the sample container. Note that samples for volatile organic constituents should not be mixed to minimize potential losses to the atmosphere. Alternately, composite samples may be obtained by transferring each grab sample directly to the plastic sample bag, provided there is sufficient room in the sample to ensure thorough mixing of the sample within the bag. (Since the laboratory may only use a small portion of the total sample, it is important that the sample be thoroughly mixed so that the analysis is representative of all sample grab locations.)

6. Sample containers should be labeled, at a minimum, with sample date and sample number to permit cross referencing with the field notebook. If the sample is not to be submitted as a completely blind sample, other information may also be appropriate including sample depth, station identification, soil type. Refer to **HF-SOP-29**, Labeling and Documentation of Samples.

7. Refer to **HF-SOP-5**, Chain-of-Custody, and **HF-SOP-4**, Packing and Shipping Samples for sample handling procedures.

8. All equipment which contact the soil should be decontaminated after collecting the sample. Refer to **HF-SOP-7**, Decontamination of Sampling Equipment.

4.0 ASSOCIATED REFERENCES

HF-SOP-31 **FIELD NOTEBOOKS**

HF-SOP-29 **LABELING AND DOCUMENTATION OF SAMPLES**

HF-SOP-5	**CHAIN-OF-CUSTODY**
HF-SOP-4	**PACKING AND SHIPPING SAMPLES**
HF-SOP-7	**DECONTAMINATION OF SAMPLING EQUIPMENT**

STANDARD OPERATING PROCEDURE

RINSATE BLANK COLLECTION©

HS-SOP-13

1.0 PURPOSE

The purpose of this procedure is to collect Quality Control blanks that can be used to assess the potential for sample cross-contamination.

2.0 EQUIPMENT

Sampling equipment to be tested
Field Notebook
Carboy with deionized water
Plastic catch basin
Surgical gloves
Sample bottles
Chain-of-Custody documentation

3.0 PROCEDURE

Collection and analysis of rinsate (equipment) blanks is intended to provide information on the contamination and cross-contamination potential introduced by sampling equipment and methods. Any surfaces which contact samples may contribute analytes of interest to the sample, thereby creating the possibility of positive bias in analytical results. Decontamination procedures (see **HF-SOP-7**) have been designed to minimize the likelihood of sample contamination. The effectiveness of decontamination of sampling equipment is monitored by rinsing equipment with deionized water, and measuring the concentration of parameters of interest in the resulting "blank" sample.

In general, any equipment used to collect, composite, or store samples that directly contacts the sample should be subjected to the rinsate blank procedure. Examples include pumps, filters, bailers, bottles, coring devices, shovels, trowels, and large containers used for compositing a number of samples. Other items may also require decontamination and testing through collection of rinsate blanks. The following steps describe basic rinsate blank collection procedures. Specific methods used should be documented in field notebooks whenever rinsate blanks are collected.

1. Obtain sample equipment and be sure it has been decontaminated using appropriate procedures in **HF-SOP-7** (Decontamination of Sampling Equipment).

2. Run about 50 mLs of water through carboy spigot to clean it out before collecting blank sample.

3. Place the equipment under the carboy spigot and inside the catch basin. The catch basin can be made by cutting the top off a sample bottle.

4. With surgical gloves on, open the spigot and run water over and/or through the sampling equipment. The water should contact the area of the equipment that is likely to contact the material to be sampled. Use only enough DI water to completely rinse the equipment surface. Excessive volumes of rinse water can dilute chemical concentrations in the rinsate blank, with a resulting loss of information.

5. Obtain enough water in the catch basin for the desired analysis.

6. Carefully pour water from the catch basin into the appropriate sample container for the parameters of interest, and add any necessary preservatives.

7. Document rinsate procedures in field notebooks, including a list of equipment rinsed, volumes of deionized water used, and the source of the deionized water.

STANDARD OPERATING PROCEDURE

SOIL SAMPLING PROCEDURE FOR TEST PITS
HS-SOP-57

1.0 PURPOSE

This procedure describes the technique for collecting soil samples from test pits excavated with a backhoe.

2.0 EQUIPMENT

- Stainless steel trowel;
- Ziplock plastic bags (inorganic samples) or glass jars with teflon covers (organic samples);
- Surgical gloves; and
- Ladder.

3.0 PROCEDURE

1. Locate site on map, record site description (**Identification and Description of Field Sampling Sites - HF-SOP-2** and use form **HF-FORM-407**).

2. Direct the backhoe operator to excavate the pit. For pits deeper than 5 feet, one pit face will be sloped in accordance with OSHA requirements.

3. Using the stainless steel trowel, collect samples at depths specified in project work plan. First scrape area of pit wall to be sampled, discarding these first scrapings, then scrape again to peel off sample of uniform thickness throughout depth to be sampled. Be sure to clean trowel between depths sampled.

4. For grab samples, soil collected using a stainless steel or plastic spoon (at the surface or at depth) should be placed directly into the sample container. For metals samples a plastic zip-lock bag is an appropriate container. For organic samples, a glass container is required unless otherwise specified. Generally, coarse material should be excluded from the sample (greater than approximately 1/4 inch where feasible).

5. For composite samples or field split samples, the soil grab sample should be transferred from the stainless steel or plastic spoon to a stainless steel mixing bowl, Teflon tray, or similar device free of potential sample contaminants. Once all grab samples are collected, the sample should be thoroughly mixed prior to transferring the sample to the sample container. Note that samples for volatile organic constituents should not be mixed to minimize potential losses to the atmosphere. Alternately, composite samples may be obtained by transferring each

grab sample directly to the plastic sample bag, provided there is sufficient room in the sample to ensure thorough mixing of the sample within the bag. (Since the laboratory may only use a small portion of the total sample, it is important that the sample be thoroughly mixed so that the analysis is representative of all sample grab locations.)

6. Record date and time, depth of samples, soil description, etc. on HF-FORM-703 (Test Pit Field Form). A blank form is attached.

7. Direct backhoe operator to backfill pit.

8. Decontaminate trowel and backhoe bucket in accordance with between sample sites, in accordance with HF-SOP-7 (Decontamination of Sampling Equipment).

STANDARD OPERATING PROCEDURE
FIELD TEST PIT LOG COVER FORM©
(HF-FORM-703)

HYDROMETRICS, INC.® **Test Pit Name:**

Field Log Cover Form

Project Information

Name _____
Client _____
Property Owner _____
Project Number _____

Point Identifying Information

Point ID _____
County _____
State _____
Legal Desc. _____
Desc. Location _____
Samp. # Prefix _____
Hole Depth _____
Elevation (GS) _____
Elevation (MP) _____
Northing _____
Easting _____

Excavation Information

Date Started _____
Date Finished _____
Recorded By _____
Equipment Owner _____
Equipment Operator _____
Excavation Method _____
Excavation Dimensions (L x W x D) _____

Measuring Information

Datum _____
Static Water Level _____
Static Water Date _____
MP Description _____
MP Height _____

Signature

STANDARD OPERATING PROCEDURE
TEST PIT FIELD FORM: GRAPHICAL LOGS©
(HF-FORM-703)

HYDROMETRICS, INC.® Photos: Y N **Test Pit Name:**

Test Pit Field Form: Graphical Logs Personnel: Page of

Sample Collection Log

Depth	Length	Number	Date	Time	Sample Type	Notes

Geological Log

Top Depth	Bot. Depth	Hatching	Material Name	Unit Name

Description

Top Depth	Bot. Depth	Hatching	Material Name	Unit Name

Description

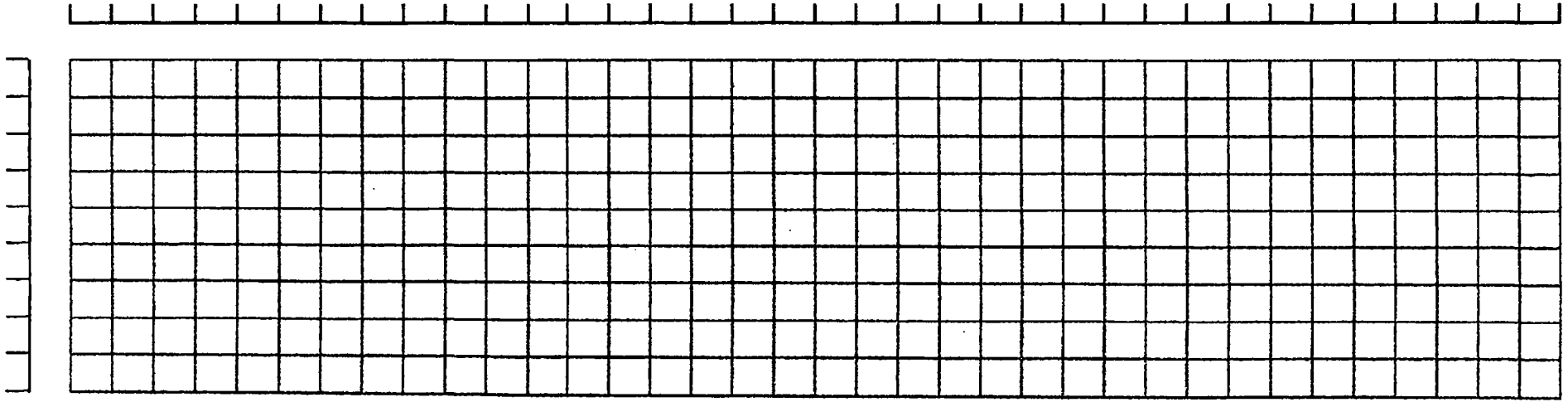
Top Depth	Bot. Depth	Hatching	Material Name	Unit Name

Description

Top Depth	Bot. Depth	Hatching	Material Name	Unit Name

Description

Graphical Description (optional)



TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1069792

SITE NAME: EAST HELENA RCRA CORRECTIVE ACTION

DOCUMENT DATE: 05/08/2008

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☑ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

EXHIBIT 1 CLEANING AND DEMOLITION FOOT PRINT EXPOSED SOIL SAMPLING AREAS

Contact the Superfund Records Center to view available document.
(303) 312-6473

TARGET SHEET

EPA REGION VIII

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  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

1 CD - 2008 INTERIM MEASURES WORK PLAN ADDENDUM
BLAST FURNACE FLUE AND MONIER FLUE CLEANING AND
DEMOLITION AND DEMOLITION FOOT PRINT EXPOSED AREAS
SOIL SAMPLING

Contact the Superfund Records Center to view available document.
(303) 312-6473